INFORMATION TECHNOLOGY

DECISION MAKING IN SOUTH AFRICA:

A Framework for Company-Wide Strategic IT Management

A STUDY PRESENTED TO THE

DEPARTMENT OF ACCOUNTING

UNIVERSITY OF CAPE TOWN

IN FULFILMENT

OF THE REQUIREMENTS FOR THE

MASTER OF COMMERCE DEGREE

IN BUSINESS DATA PROCESSING

by

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A STUDY PRESENTED TO THE DEPARTMENT OF ACCOUNTING UNIVERSITY OF CAPE TOWN IN FULFILMENT OF THE REQUIREMENTS FOR THE MASTER OF COMMERCE DEGREE IN BUSINESS DATA PROCESSING.

Except where the contrary is stated, I believe this Study to be my own work. Most of it arises out of what I have learned in the course of formulating and implementing IT strategy at Old Mutual. I have presented some of its ideas in papers read at the IFIP/CSSA Conference, held in Johannesburg, in April, 1987, and at the NACCA Third International Symposium, held in Johannesburg, in September, 1988. In its totality, however, the Study has not previously been published.

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ABSTRACT

The area of interest in which this Study is set is the linking of a company's business strategies with its strategic planning for IT (information technology). The objectives of the Study are: to investigate how the IT planning environment is changing for business enterprises in South Africa; to establish how successfully South African companies are managing IT strategically; to propose a new approach to strategic IT decision making that will help South African management deal with the major issues; to propose a way of implementing the approach.

In Chapter 2, conclusions are drawn from an examination of the key strategic IT planning literature. It appears that fundamental changes are indeed taking place, and are producing significant shifts in the way researchers, consultants and managers think about IT.

The survey of South African management opinion is described in Chapter 3. The opinions analyzed range over environmental trends, strategic decision making practices, and what an acceptable strategic IT decision making framework would look like. The need for a new, comprehensive approach to strategic IT decision making in South Africa is clearly established.

In Chapter 4, a theoretical Framework is proposed as a new, comprehensive approach to strategic IT decision making. The Framework covers five strategic tasks: analysing the key environmental issues; determining the purposes and uses of IT in competitive strategy and organizational designs; developing the IT infrastructure, human systems, information systems, and human resources to achieve these purposes and uses; implementing the strategic IT decisions; and learning to make better strategic IT decisions.

In Chapter 5, ways of implementing the Framework in practice are identified. A means of evaluating its acceptability in a specific company is also proposed.

The general conclusions of the Study are presented in Chapter 6.

The Framework developed in this Study is intended for use, not directly by the IT decision makers themselves, but by the persons responsible for designing the IT decision making processes of the company. It is not, however, offered as a theory or a methodology. The aim is simply to provide a conceptual "filing system", to help designers uncover and classify the IT strategy problems of their own company, to identify the tools their decision makers need, and to put appropriate problem solving processes in place.

"Today we have naming of parts. Yesterday,
We had daily cleaning. And tomorrow morning,
We shall have what to do after firing. But today,
Today we have naming of parts."

Henry Reed,
"Lessons of the War"

"In a general way it may be said that to think in terms of systems seems the most appropriate conceptual response so far available when the phenomena under study - at any level and in any domain - display the character of being organized, and when understanding the nature of the interdependencies constitutes the research task." [Emery & Twist, 1965: 21]

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CHAPTER 1

INTRODUCTION

I. BACKGROUND TO THE STUDY

The area of interest in which this Study is set is the linking of a company's business strategies with its strategic planning for IT (information technology).

Even where the development of information systems strategies for business is the explicit subject matter in the literature, the correspondence between business strategy concepts and those of IT planning is seldom made clear. Part of the problem seems to lie in the fact that few writers deal comprehensively with a wide enough range of strategic IT management issues. Few also recognize that an IT infrastructure is a matter of strategic capability, which can and should be planned independently and in advance of particular application systems.

McFarlan observes that IT planning research has hitherto been done by information systems professors and professionals "without the perspectives of corporate strategy formulation, organizational behavior, and general management", while the business planning research has been done by people "with only a cursory understanding of information technology, its issues, and their impact on the organization." [McFarlan, 1985: 309]

To bridge the conceptual gap between business thinking and IT thinking, many writers [e.g. Bakopoulos & Treacy, 1985; McFarlan, 1984; Parsons, 1983; Porter & Millar, 1985] are now using Porter's [1980; 1985] concepts of competitive strategy and competitive advantage to obtain insights into ways in which IT can be applied in the company's strategies.

At the same time, insights into the relative importance of different technologies in different industries are arising out of research such as Collier's [1983] investigation into the automation of the Service Sector, Chorafas' [1983] study of information systems in Japanese financial institutions, and the Life Office Management Association [1981] study of evolving trends in communications technologies. Together with an analysis of the firm, either as a chain of value activities and linkages [Porter and Millar, 1985], or as a resource life cycle [Ives & Learmonth, 1984], such insights can lead to the identification of good IT investment opportunities for the company.

There are also aids to creative thinking, such as IBM's "S*P*A*R*K" [Ives, Sakamoto & Gongla, 1986]. This is a prototype of an expert system capable of citing from its knowledge base cases in which IT has been applied to strategic purposes in situations similar to that of the enquirer.

Recognition is one thing, readiness is another. While recognizing the opportunities for using different kinds of IT in business strategies is in itself a significant achievement, it is not enough to guarantee successful implementation. What is also needed is a company-wide IT infrastructure, and an accompanying decision making process, built to guarantee that likely future technologies will be evaluated, implemented and assimilated rapidly and cost-effectively, so that market opportunities will not be lost in long development lead times.

Two similar approaches to developing and building such an infrastructure have been proposed by practitioners. One is Online People's "B+OL+D" methodology [Benjamin, Seminar E-01] for formulating the architecture of a company's "corporate-wide information technology environment" or "CWITE". The other is Nolan, Norton & Company's "computer technology architecture", described in the Technology Management Series video training courses [Advanced Systems Inc., 1985].

A second requirement for a successful IT strategy is that both the business and the IT managers in the company should learn to make the relevant decisions with increasing effectiveness as their, and the competition's, experience grows. This is "organizational IT learning", and it is a success factor at two levels of management [Raho, Belohlav and Fiedler, 1987]:

> Firstly, Nolan, Norton & Company [Advanced Systems Inc., 1985: Course 3935] describe six stages in the overall development of the company as a user of IT, and a "discontinuity" between the three early stages and the three advanced stages that must be managed in a structured manner. They warn against attempting advanced stage IT strategies before the necessary infrastructure is in place, and before the quality of management thinking is ready for them.
>
> Secondly, it has been suggested [McKenney & McFarlan, 1982; Cash & McCleod, 1985] that there are phases in the introduction of a particular new technology into an operating unit of the company that must be managed, each in a different way.

There is considerable debate in the empirical literature as to the validity of these learning models (see, for example, Benbasat, Dexter, Drury & Goldstein [1984], Drury [1983], King & Kraemer [1984], Raho, Belohlav & Fiedler [1987]), but they seem to have been widely accepted in practice and in university teaching.

At both levels of learning, significant differences of background, knowledge and motivation between people in the business world and in the IT world [Benson & Parker, 1985: 8; Cougar & Zawacki, 1979] add to the uncertainty as to what transfers between the business and IT fields of expertise are feasible and desirable. For example, an attempt to rephrase IT strategy issues in a business strategy language will misfire if the business managers of the company are unfamiliar with the jargon of the particular strategic framework chosen.

In practice, the learning problem reduces to the development of mutual understanding through a "dialectic of implementation" [Churchman & Schainblatt, 1965]. The problem is dialectical precisely because applying IT to the business strategy can and often will change that strategy.

> "[Enterprise-wide information management] results in the alignment of Information Technology with the enterprise plans, and the alteration of the enterprise goals through the use of Information Technology." [Benson & Parker, 1985: Abstract]

> "To see that an information system is a [strategic information system], we need to understand how information systems are used to support or shape the firm's competitive strategy. This ability to see and understand I call strategic information systems vision." [Wiseman, 1985(1): 9]

This, then, is the major theme running through the theoretical Framework described in Chapter 4: dialectic, learning, and adaptation of company goals.

In a survey of 25 existing methodologies, IBM's Enterprise-wide Information Management (EwIM) researchers found not one that addressed the linking of business and IT strategic decision making at all comprehensively [Benson & Parker, 1985: 27-28; 1986(1)]. Nevertheless, they felt able to suggest that a conceptual linking of Porter's [1985] value chain concept to the financial justification of IT could be what "will provide the great leap forward for evaluating the financial impact of information technology as it permeates the enterprise" [Benson and Parker, 1986(2): 10].

This is the second theme of the theoretical Framework: the purposes of IT in competitive strategy, its uses in organizational design, and its justification in terms of competitive advantage.

Even without the availability of proven analytical techniques, there is still much that can be done to develop strategic IT decision makers in both the business and the IT worlds, as people with a useful variety of knowledge and skills and capable of different but complementary insights into the critical issues. The decision making processes of the company can be adapted to help these people, individually and collectively, to arrive at effective answers to the critical questions of IT strategy:

> In this industry, how can IT be applied to make a company more profitable?
>
> In this company, what kinds of error in applying IT would be fatal?
>
>> "Although large firms seldom die, some errors are extraordinarily costly relative to others. The measure of cost is usually years of earnings losses as well as decline in market share. Often it is disappearance in an acquisition. Only seldom is bankruptcy the outcome." [Bower, 1982(1): 38 n.]
>
> How can this company's management team learn to make the right applications and avoid the errors?

What is critical will depend on the situation and the particular strategy being attempted, but the attributes of a process that will expose the relevant issues can be specified.

This Study is intended to contribute towards an understanding of company-wide strategic IT decision making, at all levels of company management involved in formulating, implementing and controlling IT strategy.

The Study does not depart too far in either direction from the interface between business decision making and IT decision making. The problems at this interface are enough to justify such concentration.

II. TERMINOLOGY

Appendix C provides a Glossary of words and phrases which belong to other authors, or which are in general use but are used in a special way in this Study. Since these terms are used without explanation in the text, a quick preliminary scan of Appendix C is advised.

III. OBJECTIVES

The objectives of the Study are:

A. To investigate how the IT planning environment is changing for business enterprises in general and for South African companies in particular, and whether these changes call for new approaches to strategic IT decision making.

B. To establish whether and how successfully South African companies can be said to manage IT strategically, and what is needed to improve the quality of their strategic IT decision making.

C. To propose a new approach to strategic IT decision making that will help South African management deal with the fundamental issues underlying the environmental changes and develop effective IT-based business strategies.

D. To propose a way of implementing the Framework in South African practice, which will address the key issues and lead to an improvement in the quality of strategic IT decision making.

Methodologically, the Study makes its contribution primarily as an exercise in systems analysis and design, although a certain amount of empirical research has been carried out in order to meet objectives B. and D. The acceptability of the approach in a Study such as this is argued in Chapter 3.

IV. LIMITATIONS

The Framework developed in this Study is intended for use, not directly by the IT decision makers themselves, but by the persons responsible for designing the IT decision making processes of the company. In the first place, the Framework has to be "customized" for particular organizational, cultural and other characteristics. In the second place, it is expressed in generic terms that have to be "instantiated", i.e. translated into concrete details, in order to arrive at specific IT action plans.

It is not, however, offered as a theory or a methodology. The aim is simply to provide a conceptual "filing system", to help designers uncover and classify the IT strategy problems of their own company, to identify the tools their decision makers need, and to put appropriate problem solving processes in place [cf. Benson & Parker, 1985: 22-28; 1986(3); Thomas, 1984].

As explained in Section 1.I., the Study is concerned with information technology management, and not information management as such. The latter subject is well covered in the existing literature (see, for example, Gane & Sarson [1977], International Business Machines [1984], Lucas [1985(1): 140], Ross & Bracket [1976], Teichroew & Hershey [1977].

The discussion is in terms of a profit seeking company, but with appropriate changes of terminology and transposing of success criteria it could be made to apply to almost any kind of organization. The discussion is also in terms of a company with multiple business units, but it is intended to apply also to companies where there is only one business unit, or where the notions of a business unit and central services do not arise at all. There is no logical restriction as to the size of the company, but the focus is on medium- to large-scale enterprises. The rate of response from the smaller companies surveyed (Section 3.III.A.) was very low, and it may be true that such companies do not feel the need for an elaborate decision making Framework.

V. OVERVIEW OF THE STUDY

In Chapter 2, conclusions are drawn from an examination of the key strategic IT planning literature. It appears that fundamental changes are indeed taking place in both the external and internal planning environments of companies. These changes are producing significant shifts in the way researchers, consultants and managers think about IT and its purposes and uses in a company. The literature relates largely to overseas experience, and it is necessary to investigate the South African situation as part of the field study.

The survey of South African management opinion is described in Chapter 3. The opinions analyzed range over:

Managers' perceptions of environmental trends and the importance of these to their companies.

Companies' strategic IT decision making practices and how successful these are deemed to be.

The features of an acceptable strategic IT decision making framework.

The need for a new, comprehensive approach to strategic IT decision making in South Africa is clearly established.

In Chapter 4, a theoretical Framework is proposed as a new, comprehensive approach to strategic IT decision making. When customized and instantiated, the Framework will help management carry out five strategic tasks:

Identify and bring into consideration the key environmental issues in strategic IT decision making.

Identify the content of strategic IT decisions, i.e. the purposes and uses of IT that create competitive advantage.

Define and develop the IT infrastructure, human systems, information systems, and human resources that will achieve these purposes and uses.

Implement effective processes for carrying out strategic IT decisions.

Ensure that the organization learns through experience to make better strategic IT decisions.

In Chapter 5, to assist in planning the implementation of the Framework, the major constructs are identified and mapped to IBM's "EwIM Action Plan". They are then reviewed in the light of the findings of the field survey, and a framework for evaluating their acceptability in a specific company is proposed.

The general conclusions of the Study are presented in Chapter 6.

VI. <u>ACKNOWLEDGMENTS</u>

I am indebted to Art Benjamin of Online People, Inc., Toronto, Ontario, for the fundamental concepts of IT architecture that

guide much of my thinking. The insight is his that IT infrastructure is a matter of strategic capability, which a company can and must control before it can use IT as a "competitive weapon" in a sustained, effective way. If this is true, then it follows that IT can confidently be used to shape company mission and strategy.

The notion of "impact IT strategy" this brings to business thinking belongs to Marilyn Parker and Bob Benson of IBM's Enterprise-wide Information Management (EwIM) research. So too does the clarification as a concept of the fundamental difference between the business decision making domain and the IT decision making domain in a company, on which the dialectical approach to strategic IT decision making proposed in the Framework hinges.

I am grateful to these people, and to the other academics, consultants and practitioners who spent valuable time with me, or in filling out the very lengthy questionnaire. I acknowledge my debt to them and to the other authors cited or paraphrased in the Study, especially those listed in Section 2.IV., but I accept full responsibility for errors I may have made in the way I use their ideas.

Except where the contrary is stated, I believe this Study to be my own work. Most of it arises out of what I have learned in the course of formulating and implementing IT strategy at Old Mutual. I have presented some of its ideas in papers read at the IFIP/CSSA Conference, held in Johannesburg, in April, 1987, and at the NACCA Third International Symposium, held in Johannesburg, in September, 1988. In its totality, however, the Study has not previously been published.

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CHAPTER 2

PERSPECTIVES OF IT STRATEGY

I. INTRODUCTION

The four objectives of the Study are stated in Section 1.III. The view of the business and IT management literature described in this Chapter is aimed specifically at the first objective:

A. To investigate how the IT planning environment is changing for business enterprises in general and for South African companies in particular, and whether these changes call for new approaches to strategic IT decision making.

The study of strategic management and of IT management as disciplines in their own right is, in both cases, not much older than 30 years or so [Ansoff & Brandenburg, 1967: B-219; McFarlan, 1985: 309; Steiner, Kunin & Kunin, 1983: 12]. Nevertheless, each has already accumulated a vast literature. For useful overviews on the business side, see Ansoff & Brandenberg [1967], Camerer [1985], Schendel & Hofer [1977: 1-22], and Thomas [1984]. On the IT side, see Boynton & Zmud [1987], Mason [1985], and Wiseman [1985: Appendix A]. Payne [1986] provides an overview of trends in the strategy consulting arena.

In strategic management, the literature ranges from philosophical and methodological issues, through mathematical explanations of market and business dynamics, to "cookbook" guidelines for formulating and implementing business strategy. In IT management, it ranges from "classical" issues - e.g. the role and organization of the information systems function; the planning of application systems; the management of data as a corporate resource - to the "modern" issues - e.g. how IT can be applied, as a business technology, to the creation of competitive advantage; the part played by organizational learning in gaining and sustaining such advantage; company-wide "systems architecture".

The literature search for the present Study was by no means exhaustive, yet it is clear from the list of references given in Appendix F that a fair amount of ground had to be covered. A number of the practitioner-orientated journals in the fields of information systems and business strategy over the last six or seven years, and a number of standard textbooks, were scanned, but most of the material actually used was tracked through citations. No such IT support as Dialog or SABINET was used, nor was any such rigorous processing method as content analysis.

Thus the selection of basic concepts was informal and intuitive, but it was steered by the argument developed in Section 2.II., the framework-building requirements described in Section 2.III., and the design principles described in Section 4.1.III.

II. THE CHANGING FOCUS OF SYSTEMS THINKING

As a company becomes more competitive through its use of IT, it grows increasingly dependent on this technology for survival and success. The internal processes and external relationships of the organization grow more complex, and IT assumes a new and critical significance as a core technology of the enterprise. The rate of innovation in this technology has become so great, however, that many business planning assumptions are certain to be invalidated before medium-term objectives, and often even short-term goals, can be realized. This dilemma alone makes it necessary to re-examine the way in which the technology is being managed in companies that depend on it.

Traditionally, the role of IT has been seen to lie in the automation of processes, management information and decision support, within the organization. Systems crossing the company boundary have usually still had an inward-looking orientation, e.g. the processing of order entries, goods consigned and accounts receivable, and access to publicly available information services like Reuters and Dow-Jones.

Within the company, applications development projects have usually followed the existing departmental boundaries. Where it is acknowledged that systems "integration" will be needed some time in the future, little or nothing is provided in the system designs to ensure that this will turn out to be feasible.

> "Unfortunately it is not often that independently developed systems coalesce into larger, nicely interlocking aggregations. It usually happens that later, after determining how some things (if not everything) should have been tied together, a major systems overhaul or complete redo must be undertaken to achieve meaningful integration." [Blumenthal, 1969: 23]

Traditional IT development plans have also tended to have short horizons, and cost/benefit evaluations have been carried out on a per-project basis. The piecemeal acquisition of technologies has resulted in unconnected "islands of automation" in many companies [McKenney & McFarlan, 1982].

In countries of the First World, where the availability of the requisite technological and human resources is not a fundamental issue, fragmented and short-term IT planning can lead to success, even though with some loss of efficiency. There is no question whatever about the continued supply of hardware and software, and indeed a company can sometimes take provisional action until the technologies it needs become available [Blauman, 1987].
Similarly, while complaints about the world-wide scarcity of IT skills have become a clichè, many companies seem able to

press ahead with major, resource-intensive IT strategies in spite of it. The falling price/performance ratio of IT is another fact of First World life, as is the decline of hardware costs relative to other IT costs.

In South Africa, however, thanks to international sanctions, the brain drain, the fall in the value of the Rand, and the political and social specifics that are the root cause of most of these problems, the cost and availability of human and IT resources are fundamental, strategic problems. In this country, serious effort has to be given to "doing it right the first time".

In these and the many other environmental pressures, IT is sometimes the cause of the problem, sometimes the means of coping, and always a source of business opportunity and threat. The dilemma here is that IT is at one and the same time an essential means for, and a critical constraint on, a South African company's strategy. This makes it absolutely essential to re-examine the way in which the technology is being managed.

It can be argued that in conditions of such uncertainty and ambiguity, it is essential for management to develop some shared vision of an ideal operating environment, set well beyond the ordinary planning horizon, in which IT would be optimally applied in the business strategy. The ideal may well be unattainable, but a well-communicated management belief that progress towards it is possible during and after the period planned for [Ackoff, 1981: 63] provides the crucial direction and motivation needed in formulating and implementing effective IT capability in the company. The argument will be most convincing if it can be shown that progress can take place incrementally, i.e. in well-managed stages and without premature commitment of specific resources. If, moreover, the vision is to be truly implementable as effective operating capability, given the necessary time and resources, it must must be expressed in constructive terms that could lead to feasible implementation projects.

In the following Sections, traditional views of the role and management of IT in business are contrasted with new views that are now emerging. The aim is to expose some of the difficulties involved, firstly, in arriving at a shared vision and, secondly, in capturing it in an architecture for incremental implementation.

A. The Traditional Perspective

Wiseman [1985: 201-225] sketches the history of traditional perspectives in information systems thinking. Much of this thinking was based on Anthony's [1965] framework for the analysis of strategic planning, management control and operational control in business.

"Strategic systems" were equated with the strategic planning level in Anthony's framework, and emphasis was shifted away from the automation of operational and control processes towards "decision support" and "management information" as the proper areas for strategic applications.

Applications "portfolios" were conceived in strategically neutral terms, e.g. the six categories generated by the three levels of Anthony's framework and the two conventional application classes, "automating basic processes" and "satisfying information needs" [Wiseman, 1985: 213]. The original Nolan, Norton & Company framework for computer opportunity identification [Nolan, 1982: 77-92] was an elaboration of this very simple model.

Writers offering "a general scheme for relating systems to the jobs they are really supposed to do" [Zani, 1970: 95], have interpreted the strategic purposes of information systems at various levels of generality, ranging from "support for corporate objectives", through "support for top management decision making", down to actual methods of use, such as "access to strategic data", or "monitoring critical costs".

When attempts have been made to link such levels analytically, e.g. the TRW Systems Group's "requirements tree" [McLean & Soden, 1977: 128-131], the emphasis has usually been on the analysis of data and application systems, or on the problems of managing the information systems function. The technology _per se_ would typically be confined to a brief introductory overview [for example, Davis and Olson, 1985], or brought in at the end of the discussion as a physical constraint on some supposedly optimal logical design [e.g. Holland, 1983]. On the other hand, when the technology was treated in detail the insights into its role in business strategy were typically sparse [e.g. Champine, 1978].

The impacts of IT on the organization have always been an avowed concern of management and employees. Concerns have been expressed regarding human rights and job security, user rights and roles in system development, "human factors" and the man-machine interface, and the effect of systems on personal efficiency and effectiveness. These are concerns for the individual, which have been at the core of much of the marketing efforts for office automation and decision support products.

Concerns for the company as a whole have focused on the internal factors of the organization, and usually on only some of them at a time - automating or eliminating specific jobs, workgroups, processes and skills at the functional level, e.g. personnel, marketing, manufacturing; or supporting decision making in certain product-market segments of the organization, e.g. cash management accounts, commercial insurance, small goods division, investments management.

Traditionally, information systems management concerns have revolved around three major issues: the requirements for good technical management, in both operations and development; the internal organization and staffing of the information systems function(s); and the appropriate location of these in the official organization structure.

There is a vast literature exploring the information systems management issues in detail at the operational, management control, tactical planning and functional strategy levels. Examples are Blumenthal [1969]; Burch & Strater [1974]; Davis & Olson [1984]; Inmon [1983]; International Business Machines [1981]; Lucas [1985]; McLean & Soden [1976]; Murray [1984]; Nolan [1982].

It is only recently that any of the above three areas of concern - applications, organization and IT management - have been specifically related to business or corporate strategy topics. Typical of this new perspective are Alloway [1987]; the Butler Cox Foundation Report Series; Cash, McFarlan & McKenney [1983]; Chorafas [1986]; Keen [1986]; Meyer & Boone [1987]; the Nolan, Norton & Company Technology Management Series video training courses [Advanced Systems Inc., 1985]; Selig [1983]; Strassman [1985]; Tapscott, Henderson & Greenberg [1985]; Wiseman [1985].

B. <u>The New Perspective</u>

In this new work, there has emerged a point of view from which IT and an IT infrastructure are seen as matters of the company's strategic capability, which can and should be planned in advance of particular business strategies and indeed in advance of particular application systems and organization structures (cf. Ansoff, DeClerck & Hayes, 1976: 71).

In such thinking, great emphasis is placed on being clear about the strategic purposes of IT in the company. And, because the thinking takes place in advance of particular strategies and application requirements, it is necessary to express these purposes in generic terms - generic competitive strategies, generic organizational and data structures, generic human and information systems, generic decision making roles and processes.

Wiseman [1985:6], for example, suggests a strategically "aggressive" generic framework for identifying systems opportunities, to replace the neutral approach referred to above. In Wiseman's model, there are 15 categories, generated by three "strategic targets" - supplier, customer, competitor - and five "strategic thrusts" - differentiation, cost, innovation, growth, alliance.

Porter & Millar [1985] and Ives and Learmonth [1984] offer two different but complementary generic views of a company's organizational structure. The former views the company or business unit as a chain of value activities, which can be analyzed in terms of their respective contributions to overall company performance. The latter views the customer's business as a resource life cycle, at many points of which the company can interlock its own systems to improve the customer's business performance, thereby securing its loyalty. Both views are capable of providing the link between the analysis of strategic purpose and the design of organizational forms and information systems. They could, for example, serve as the procedural goals and sub-goals in an information control net analysis of company processes [Ellis, 1983: Fig. 1].

Clearly, the effort to analyze and manage the company's strategic IT capability in these terms must entail a new understanding of the purposes and scope of information systems in business. Internally, applications requirements analysis must now take a macro view if not of all company processes then at least of a complete strategic business unit [Ohmae, 1982: 144-148]. A well defined and practical subset of human systems and associated information systems must become the unit of business systems analysis, so that the ways in which human jobs and computer processes can be better aligned to create IT capability can be studied.

It is already apparent in the competitive weapon stories that applications are being designed and installed with fundamental impacts on the company's productivity, flexibility and competitiveness [McFarlan, 1984; Porter & Millar, 1985].

Externally, a macro view of business systems analysis encompasses entire organizations, to be planned for as inter-communicating wholes. Networks are being implemented that transcend company boundaries [Cash & Konsynski, 1985] and are capable of "dis-intermediating" entire business sectors [Cymbala, 1986].

All of this requires a much broader view than is traditional of the role and responsibility of the information systems function. The information systems management issues referred to above remain, and indeed become more critical, but the emphasis now shifts to the reformulation and regrouping of information systems functions, and to their redistribution throughout the organization.

Redistribution may mean centralization or decentralization, depending on the circumstances (see, for example, Ein-Dor & Segev [1982]; Olson & Chervany [1980]; Zmud [1984]). In the Framework developed in Chapter 4, IT support functions are treated generically, and the IT organization structure realized in practice will be a means, not an objective, of IT strategy. Sometimes, it is found in practice, the information systems department can be structured as a strategic business unit in its own right (see, for example, the cases of British Leyland [Kransdorff, 1982], Boeing [Rifkin, 1986], and Morgan Stanley [Cook R., 1986]). Such units will have internal transfer pricing arrangements of varying degrees of complexity, and infrastructures capable of selling their services in the open market.

Conceptualizing systems opportunities and their management in this new perspective brings the analysis of external and internal environmental forces, and their impacts on company strategies, structures and processes, squarely into the purview of strategic IT decision making. IT planners move significantly beyond their former preoccupation with the technical issues and closer to the world of corporate planning. This shift in perspective presents a particularly strong challenge to South African decision makers to widen their frames of reference to include a synthesis of business and IT environmental issues [cf. Anderson, 1985].

World-wide Political and Economic Forces: The increasing isolation of South Africa from the world community, and the performance of its mixed First World/Third World economy, hold crucial implications for both business and IT planning.

Global Competition: Shifts in international competitive positions hold opportunities for expanding the geographical scope of South African companies' markets (e.g. through data communications technology), as well as threats (e.g. the U.S.A. bringing pressure to bear on Japan to stop its indirect supply of IT to South Africa through Germany and other countries).

Structural Changes in the National Economy: Deregulation and privatization of Post Office and other Government monopolies have obvious implications for IT strategy. Also, the ability of the country to create and maintain an indigenous IT industry is affected both by world-wide forces (e.g. the supply of base technology) and national political and economic structures (e.g. the effect of Government policy on the location and viability of the new industries).

Production Economics: Changes in the costs of IT relative to other resources (up in South Africa, down in other countries) affect the viability of proposed IT applications, and add economic force to the moral question of what constitutes appropriate automation in a country with South Africa's demographics. On the other hand, new processes, products, life cycles, and markets are made feasible by new levels of functionality and capacity in IT. This could in turn lead to the creation of jobs, possibly by making businesses viable on a much smaller

> scale than was conventionally thought necessary [cf. Schumacher, 1974: Ch. 5]. This is a crucial issue for South African decision makers, and it requires levels of insight and intention that are by no means widely distributed in the population.

Thus the new perspectives on IT management open up vast new ranges of opportunities and threats that IT decision makers can and should consider, as the technology permeates the company's internal processes and external relationships. In South Africa especially, great management vision is necessary and great effort is justified in achieving consensus and commitment to it. It is only being realistic to suggest that the vision should be formulated in precise and practical terms, as a common ideal towards which all IT decision makers can work.

To do this, IT decision makers need a frame of reference that treats the development of an IT infrastructure as a matter of strategic capability to be managed well ahead of particular business strategies, and which places strategic IT decision making firmly into the context of the company's ordinary business planning processes

III. <u>THE NATURE OF THE FRAMEWORK</u>

Conceptual "models" and "frameworks" are both simplified representations of situations in the real world, but they have different purposes.

The main purposes for which conceptual models are built are analysis and prediction [Koutsoyiannis, 1983: 3]. In analytical models, a set of assumptions is used to derive "laws" that describe and explain "with an adequate degree of generality" the attributes of and relationships among the entities modeled. Predictive models aim at forecasting the consequences of changes in the attributes and relationships of the entities modeled. In both kinds of model, definitions and derivations are logically rigorous, are often formulated in mathematical terms, and are always based on considerable prior understanding of the situation being modeled.

A framework, on the other hand, is a more informal guide to thinking. It is aimed at bringing some sort of conceptual structure to problem definition, i.e. at creating the prior understanding that is needed before formal analytical or predictive modeling, or any other solution process, can begin. While the logic of a framework must be sound, its ability to spark creative thinking and to get people from different backgrounds talking on the same wavelength is far more important than its mathematical rigour. Its output is not theorems or predictions, but the insight and mutual understanding that clarify complex problems and prompt productive activity towards consistent, sustainable solutions.

> "Or to say it another way, you can catch phenomena in a logical box or in a mathematical box. The logical box is course but strong. The mathematical box is fine grained but flimsy. The mathematical box is a beautiful way of wrapping up a problem, but it will not hold the phenomena unless they have been caught in a logical box to begin with." [Platt, 1964]

Two broad classes of framework aim at clarifying the problems of strategic IT planning:

> Analytical Frameworks: These help in breaking down the detail of a specific problem area. Well-known examples are "Business Systems Planning" (BSP) [International Business Machines, 1984], for identifying IT application areas and company data structures, and Nolan's "stages theory" [Nolan, 1982: 6] for bench-marking the company's stage of development in IT decision making.

Dialectical Frameworks: These help in assembling and synthesizing several problem areas in an effort towards some sort of holistic solution. Dialectical frameworks are as much concerned with problem solving process as with problem content, with assumptions and opinions as with data and facts. With regard to problem content, examples of these frameworks are the "B+OL+D" methodology for developing the "corporate-wide information technology environment" [Benjamin, Seminar E-01], and Nolan, Norton & Company's "computer architecture strategic planning" [Advanced Systems Inc., 1985: Course 5055]. With regard to process, examples are the Delphi and nominal group techniques [Delbecq, Van de Ven & Gustafson, 1975] and the technique of dialectical enquiry [Mason & Mitroff, 1981; Mitroff & Emshoff, 1979].

Chapter 4 presents a dialectical, conceptual Framework aimed at sorting and clarifying the problems of strategic IT decision making, and at exposing linkages between assumptions and data, and between one problem and another.

IV. THE PRINCIPAL SOURCES

The structure of the Framework relies heavily on the following sources:

For fundamental concepts of company-wide information and information technology management: IBM's "enterprise-wide information management (EwIM)" [Benson & Parker, 1985; 1986]; the Tapscott, Henderson & Greenberg [1985] "strategic framework for integrated office systems".

For the notion of systems architecture as a vehicle for business strategy: Nolan, Norton & Company's "computer architecture strategic planning" [Advanced Systems Inc., 1985: Courses 3947 and 5055]].

For the technical constructs of IT architecture and the IT support organization: the "B+OL+D" methodology [Benjamin, Seminar E-01].

For competitive strategy as a framework in which to analyze the purposes of IT in business: Porter's concepts of "competitive forces", "generic strategies" and "competitive advantage" [Porter, 1980; 1985; Porter & Millar, 1985].

For systems-orientated views of company organization structure as the link between competitive strategy (IT purposes) and human/information systems planning (IT uses): Porter's concept of the "value chain" [Porter, 1985; Porter & Millar, 1985]; Ives & Learmonth's concept of the "customer resource life cycle" [Ives & Learmonth, 1984]; the Xerox Palo Alto Research Center concept of "information control nets" [Ellis, 1979, 1983; Ellis & Nutt, 1979].

For practical applications of contingency theory in strategic IT decision making: McFarlan's "strategic grid" [McFarlan, McKenney & Pyburn, 1983], and "portfolio risk model" [McFarlan, 1982].

For the organizational development (OD) framework within which to manage the long-term, company-wide transitions entailed in implementing IT strategy: Beckhard & Harris' [1977] application of OD principles to the change management process in large, institutional systems.

For practical models of organizational IT learning: Nolan, Norton & Company's "stages theory" of IT development [Advanced Systems Inc., 1985: Courses 5050 and 5051; Nolan, 1982: Ch. 2]; McKenney & McFarlan's "technology assimilation model" [Cash & McCleod, 1985; McKenney & McFarlan, 1982].

The philosophical underpinnings of the framework owe debts to:

Ackoff [1981]: the notions of "interactive planning" and "idealized design", which are the main justifications of the "target environment" concept.

Argyris [1977]; Argyris & Schön [1978]: the concepts of "single-loop", "double-loop" and "second-order" learning, which allow the organizational dialectic between the business and IT domains to be structured in such a way that incremental implementation of a target environment becomes a feasible proposition.

Benjamin [Seminar E-01]: the "external" and "internal" views, and the "meta-", "macro-" and "micro-" levels, of systems architecture, which in this Study are used to define the "levels of discourse" that make the concepts of incremental implementation and organizational IT learning practical propositions.

Benson & Parker [1985]: the recognition that there are distinct business and IT decision making "domains" in the company, on the particular strengths of which an organizational dialectic and a participative decision making process can be built; also, the distinction between "impact" and "alignment" IT strategies, which is a crucial consideration in IT positioning.

Bower [1982(1); 1982(2)]: problem solving and boundary setting as the essence of business policy, to which there is the corollary that IT architecture and IT positioning are the essence of IT strategy.

Etzioni [1967]: the synthesis of rationalist-comprehensive and incrementalist modes of strategic thinking, which makes the concepts of target environment and incremental implementation consistent, and plausible to a wider range of planners than either on its own would be.

Mackenzie [1986]: the concept of organizational congruency, which provides the focus for a dialectical enquiry into the purposes and uses of IT in business strategy.

Mason & Mitroff [1981]; Mitroff & Emshoff [1979]: resolving conflicts between current company mission and desirable IT opportunities through dialectical thinking.

Wiseman [1985: Appendix B]: the fundamental distinction between the "functions" and "uses" of information systems, which leads to the more general distinction between "uses" and "purposes" of IT, and hence to a simple and practical way of linking IT applications to competitive strategy - the "strategic option generator".

V. CONCLUSIONS

It is clear from the sources listed in the preceding Section, that a dialectical Framework aimed at linking fundamental issues in a new perspective of IT strategy will contain much that is unfamiliar to current management thinking.

It is also clear that the assumptions and experience underlying most of the available literature refers to other countries. Some of these may not apply in South Africa. There are also significant issues in South Africa that arise only marginally in this literature, in some such context as "multinational planning" or "technology transfer in the Third World."

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CHAPTER 3

THE FIELD STUDY

I. INTRODUCTION

The four objectives of the Study are stated in Section 1.III. The field study was aimed specifically at the second objective:

B. To establish whether and how successfully South African companies can be said to manage IT strategically, and what is needed to improve the quality of their strategic IT decision making.

Some of the problems of field research into the business use of IT are discussed in Section 3.II., and an explanation is given as to why an opinion survey is deemed an to be an acceptable approach in the present Study.

Section 3.III. provides an explanation of the survey questionnaire itself, and a discussion of the results presented in the Tables (Appendix G).

Section 3.IV. concludes the Chapter with the implications of these results for objectives C. and D. of the Study, to which Chapters 4 and 5 respectively are devoted.

II. FIELD RESEARCH PROBLEMS AND STRATEGY

A. The Problems

Research into business practices that is based solely on attitudes - opinions, beliefs and perceptions, espoused theories, avowed assumptions - cannot be enough to determine what is actually being done and what is still needed in strategic IT decision making.

At best, the attitudes expressed will represent sincere beliefs about IT and its importance in a company's business strategy. At worst, they will reflect wrong or wishful thinking. Whatever the case, the researcher still needs to get to the realities, such as the application development plans the company actually has in progress, the financial and human resources it has actually committed to IT, and the operational success of systems already installed.

> "People have theories that they use to plan and carry out their actions. ... Yet we found that few people are aware that they do not use the theories they explicitly espouse, and few are aware of those they do use." [Argyris, 1977: 119].

Often, the researcher will not have access to the relevant data of the installation. For example, estimates of project cost, benefit and risk are frequently not recorded or not made at all. Similarly, much of the data needed to evaluate how effectively an operational system or service is responding to the hopes the company had for it exists in computer operational records, which may not be retained for very long and, while they are retained, may be confidential.

Even if all the necessary hard data were available, research into strategic IT decision making support would still be confronted by two major problems: the first relates to quantification and the second to feasibility.

Some strategic IT decisions can be quantified, e.g. the expected impact of a proposed system on turnover, costs, margin, market share, and other measures of corporate success. Others cannot be, e.g. whether the proposed system will entail a shift in company mission or operating philosophy, or whether one approach to participative IT decision making would be better suited to the corporate culture than another.

Some strategic IT decisions are believed to be quantifiable, but either no metric has yet been generally agreed, e.g. the overall productivity of the IT function, or the underlying concepts are not yet clear enough to facilitate measurement and analysis, e.g. a complete cost, benefit and risk characterization of one information system or service relative to another.

The problem of feasibility arises out of the fact that, ideally, useful hypotheses about effective IT decision making support would be tested in either of two ways. Firstly, a longitudinal study can be undertaken of IT decisions actually made, in many companies, over a number of years, both before the support system was introduced and after. An attempt may then be made to evaluate the improvement, if any, in decision success rate due to the introduction of the system. Alternatively, a cross-sectional study can be made of current IT decision making activity, with one group of companies using the support system and another not using it. The improvements in decision making behaviours and processes attributable to the system may then be evaluated.

In either case there is the practical problem of separating the effects attributable to the system from the host of extraneous factors among which they will be mixed. It would be extremely difficult, if not impossible, to design a satisfactory control into a company-wide IT decision making experiment. The credibility problems described by Van Maanen [1979] will also arise - i.e. the difficulty of separating fact from fiction in what is observed and interpreted in organizational behaviour, and of deciding which fictions in organizational attitudes are indeed facts relevant to the research. It will be seen in Chapter 4. that the decision making Framework itself is vitally concerned with the role of assumptions and beliefs in strategic IT decision making.

Clearly, neither of the ideal research approaches is feasible within the practical constraints of the present Study. In fact, McFarlan [1985: 317-320] shows that, in general, University research programs in strategic IT decision making are likely to make slow progress. Firstly, there are not many multi-disciplinary research programs covering both the business and the IT domains. Secondly, qualitative, multi-year, multi-person research into "messy" problems is unpopular. Thirdly, it is difficult and expensive to sustain co-operation between business firms and faculty members over lengthy periods. Finally, since the rate of change in IT is so rapid, the research subject itself presents a "moving target".

In spite of these difficulties, a number of things can usefully be accomplished in a limited Study, and these are described in the following Section.

B. <u>The Strategy</u>

1. Theoretical Work

It is possible to build a dialectical, conceptual Framework to support strategic IT decision making based on information obtained from a fairly limited number of sources (e.g. the literature, consultants, practitioners). The effort goes more into the logical sorting and inter-linking of problems and techniques which, taken separately, are already known to exist, than into the discovery of new information and particular solutions.

> "Estimating [variances] on relationships that have been recognized to be true since biblical times is not a contribution ... But identifying new problems and describing them in an orderly way provides a chance for the whole field to move forward. Large samples are not needed. The Hawthorne experiment involved one small group of women." [Bower, 1982(2): 637]

Kennedy [1979] gives guidelines for ensuring valid generalization of research conclusions when only one case, or a small number, has been studied. In such studies, the conclusions refer to a population believed to be "sufficiently similar" to the sample, not necessarily one just like it. The actual extent of the population cannot be known to the researcher, but there is ample precedent in the legal and clinical fields for leaving users to judge whether or not their cases belong to it. The researcher provides sufficient supporting information to enable the user to make that judgment. The generalization is from case to case, rather than from case to population.

The Framework presented in this Study is generic in that it is meant to be useful in a variety of companies, through the process defined as "customization". It is left to potential users (i.e. those responsible for designing the IT decision making processes in their companies) to make two important judgments, based on the conceptual description of the Framework given in Chapter 4: whether it can usefully be customized for their companies, and whether the expected advantages to be gained by using it justify the effort and expense of implementing it.

Supporting information to enable users to make these judgments is provided in several forms: the references to the literature in Chapter 2; the design principles described in Section 4.1.III.; and the response profiles discussed in Section 3.III.C.1.

2. Validation

To make the theoretical effort worthwhile, it has to be determined that a reasonable number of users will in fact make the evaluation judgement in favour of using the Framework. Stated another way, the framework has to be designed so that it will satisfy the known needs of a reasonable number of users. From either point of view, the problem can be interpreted as one of marketing research, for which an opinion survey is a generally accepted modus operandi.

> "Attitude measures can be used to help learn which features of a new product concept are acceptable or unacceptable, as well as the perceived strengths and weaknesses of competitive alternatives. Insights can be gained into the process by which choice decisions are made: What alternatives are known and considered? Why are some rejected? What problems are encountered with the products or services that are used?" [Aaker & Day, 1983: 205].

In the context of this Study, the "new product" is the proposed decision making Framework, and the "competitive alternative" is whatever the respondent's company currently uses in strategic IT decision making.

It then follows from objectives B and D that the opinion survey should be aimed at finding out:

> What South African managers believe their companies are currently doing to manage the strategic IT decision making process.
>
> Whether they believe their companies are doing it successfully.

What more they believe the company should be doing, and what decision making support they require.

How South African circumstances differ from what is portrayed in the overseas literature.

What generic concepts, processes, techniques and tools should be included in the proposed decision making Framework to satisfy a reasonable range of requirements.

How likely it is that the Framework will be judged potentially useful and worth the effort, and whether there are any factors that can be followed up to improve its "genericness".

III. THE OPINION SURVEY

This Section describes the opinion survey that was carried out to meet the above aims.

A. The Population Surveyed

In November, 1987, the Computer Users Council of South Africa had 124 member organizations ("computer users"), classified as follows:

Class A: 50 data processing employees or more.

Class B: 10 to 49 data processing employees.

Class C: Less than 10 data processing employees.

Class D: Educational organizations, e.g. Universities, Technikons, private training establishments.

Selected Class A, B and C members, as shown in Appendix A, were polled. These are all profit seeking companies, as explained in the Limitations (Section 1.IV.). The survey questionnaire and its covering letter are shown in Appendix B. In each company, the opinions of three Types of respondent were obtained:

<u>Type A</u>: A business executive not involved in strategic IT decision making.

<u>Type B</u>: A business executive involved in strategic IT decision making.

<u>Type C</u>: An IT executive involved in strategic IT decision making.

Types B and C are close to the interface between business and IT decision making referred to in the Background to the Study (Section 1.I.), and thus the opinions come from either side of the interface. The opinions of Type A respondents were obtained as a control on Type B, to see whether and to what extent changes in business opinions are associated with close IT contact.

The range of opinions obtained is therefore not symmetric - it does not include the views of IT professionals who are not involved in strategic IT decision making. It was felt that, in the nature of the profession, these views were likely to be too technical and too distant from the business/IT interface to be directly usable in the present, limited Study.

B. <u>The Design of the Questionnaire</u>

Question 1 identifies the "Type" of manager responding - "A", "B", or "C" - as defined in Section 3.III.A.

Questions 2 to 11 ask for company data. The results are presented in Tables 1 to 5. Because of the very uneven distribution of responses by industry (see Table 1), there was not much point in using the answers to Question 4. Questions 10 and 11 were also not used, because many respondents left them blank.

Questions 12 to 27 ask for objective characteristics of the internal planning environment of the company. Responses were requested from Types B and C because it was deemed prudent to compare perceptions of "reality" from both sides of the business/IT interface. Since Type A respondents were unlikely to be familiar with the issues raised, they were not asked these questions. The results are presented in Table 6.

Questions 28 to 61 ask for opinions about the importance of a variety of topical IT planning issues, and how the company is perceived to be managing them. The questions are based partly on the five Components of the theoretical Framework, and partly on the results of a Delphi survey of IS executives and corporate general managers conducted by the MIS Research Center of the University of Minnesota [Brancheau & Wetherbe, 1987]. All three Types of respondent were asked to reply, and the results are given in Tables 7 and 8. A comparison of the South African and American ratings is given in Table 9.

Questions 62 to 75 seek respondents' opinions regarding the important elements in making sound strategic IT decisions, while Questions 76 to 91 ask for opinions regarding the quality of the actual IT decision making in their companies. The questions are based partly on the five Components of the Framework, and partly on McFarlan's "Strategic IS Grid" [Cash, McFarlan & McKenney, 1983: 216-222]. All three Types of respondent were asked to reply. The results are presented in Tables 10 and 11.

Questions 92 to 107 seek respondents' perceptions of participative IT decision making in their companies, and of the relative centralization or decentralization of IT management responsibilities. The questions are based partly on the five Components of the Framework, and partly on Buchanan & Linowes' [1980] "IS responsibility spectra". Since Type A respondents were unlikely to to be familiar with the issues raised, they were not asked these questions. The results are given in Table 12.

Questions 108 to 142 are aimed at finding out what IT decision making tools and techniques are known and/or used in the respondents' companies. Only the Type B and C respondents are strictly relevant, but the questions were also asked of Type A respondents to see how widely it may be known that there are indeed tools and techniques in this area of company decision making. The results are given in Table 13.

Questions 143 to 154 ask for opinions on how successful the respondents believe their companies to be in managing IT strategically, according to criteria that are, at least in principle, quantifiable. The opinions of all three Types of respondent were sought. The results are given in Table 14.

Questions 155 to 173 ask what the respondents believe the purposes of IT to be in the business strategies of their companies, and how well they think their companies are exploiting IT in these ways. The opinions of all three Types of respondent were sought. The results are given in Table 15.

Questions 174 to 180 are related to Questions 155 to 173, and aim at finding out which uses of IT in organizational design the respondents believe to be congruent with the different kinds of competitive strategy. The questions are about as far as one can go without asking respondents to reveal specific company strategies. Because of the technical nature of the questions, only Types B and C respondents were asked to reply. The results are given in Table 16.

Questions 181 to 184 are administrative and were asked of all respondents.

Questions 185 to 188 were intended as additional clues to the effort that would be needed to market the concepts of the Framework in South African practice. All respondents were asked to reply. The results are given in Table 17.

C. Discussion of the Responses

1. General Principles

There is no reliable evidence to indicate what proportion of all South African computer installations and employees the CUC membership represents, but the Council believes it covers about 75% of employees and almost all major sites. In any case, the responses received (see Table 1) are clearly not a representative sample of even just the CUC membership. For this reason, the set of responses will be referred to as the "pool" rather than the sample. Inferences beyond the pool have to be made on a case-by-case basis, in the manner suggested by Kennedy (Section 3.II.B.1.).

Moreover, there are manifestly too few data points to justify the use of sophisticated data analysis techniques based on the analysis of variances. The discussion of the responses relies, therefore, only on elementary comparisons of averages and percentages.

Questions 28 to 57 and 155 to 171 include a 1-to-10 rating of importance or likelihood. Only ratings of 5 or higher are discussed, which is consistent with the instructions given for responding to these questions.

Questions dealing with how well the respondent believes the company copes with an issue are based on a 5-point "very poor/very good" scale of -2 to +2, labeled according to the sense of the questions concerned. The responses received are summarized in the corresponding tables as percentage distributions over the 5-point scales. A mainly negative or mainly positive distribution is regarded as indicating a generally held opinion or perception: more than half of the responses positive or negative is regarded as a weak indication, and more than two-thirds positive or negative as a strong indication.

With regard to the responses from an individual company, the absolute difference between a Type A response and a Type C response, or between a Type B response and a Type C response, ranges from 0 to 4. An absolute difference greater than 1 is regarded as indicating a noteworthy difference of opinion between the IT person and the business person concerned, since this implies either that the one is positive while the other is negative, or that the one is strongly positive or negative while the other is at most neutral. Since a full set of Type A, B and C responses was not received from each company, it was not practical to calculate a consistent set of percentages of companies reflecting "large differences of opinion" per question. Instead, an arbitrary cut-off point of 5 has been used, i.e. any question in which more than 5 of the 20-odd available respondent pairs show differences greater than 1 calls for comment.

2. Response Profiles

Ignoring the outrider with 200 000 employees, it will be seen from Tables 1 and 2 that the pool of respondents is dominated by Finance and Class A (large) companies. The Industry sector is the catch-all for companies that did not fall into any of the other categories, and its response rate is very low relative to Finance. One may wonder why this disparity should be, bearing in mind that these are all members of the CUC with an avowed interest in the strategic issues of IT. Part of the reason may be a lower estimation of the importance of IT in Industry than in Finance, and possibly less patience with tedious "theoretical" exercises. It is interesting to note that two of the six industrial companies that did respond are motor car companies with a Japanese background, both highly competitive on a global scale, and with very strategy-minded managements. No responses at all were received from the mines.

It was felt that the only way to get reliable explanations for non-response would be personal contact, but this step was beyond the resources of the Study.

In spite of the sparseness of Table 3, it can be seen that, while the dominant company organization in the pool is Multiple Business Units, the dominant IT organization is Single Unit. Where decentralization does exist, it is more often operations than development that is decentralized. (The single respondent in column D reported centralized operations and systems analysis, with decentralized business analysis.) Hence, in this pool, strategic business decision making seems to have been decentralized to the point where it is reflected in the official organization structures, while strategic IT decision making retains a centralized focus.

Excluding the two outriders, Table 4 shows that there is wide variation in the ratio of Total Employees per IT Employee. Because the pool is so small it is difficult to draw any general conclusions from this, except to note that the ratio does vary somewhat with size of company. With a bigger pool, it may be possible to investigate the presence of such factors as the minimum viable size of an IT installation, and economies of scale and scope. There is also wide variation in the ratio of Development Employees per Operations Employee. Again, with more data it may be possible to investigate how this ratio varies according to the strategic importance of IT.

Table 5 shows a similar picture of wide variation in these ratios, according to business sector. With a bigger pool, it may be possible to explore how the above factors - minimum viable size, economies of scale and scope, and relative availability of development employees - are related to the kinds and variety of applications that are likely to arise in the different industries. One might, for example, expect that the ratio of Development Employees per Operations Employee would be higher in the Financial sector because of its supposedly higher strategic dependence on new applications, but no such inference can be drawn from the present data.

While the spread of companies and industries represented in Tables 1 to 5 is smaller than one would wish, nevertheless a fairly wide range of volumes and ratios is displayed. This should permit many potential users of the Framework to judge their companies "sufficiently similar" to the pool so that they may meaningfully compare their own opinions with those reflected in the other Tables. There is, of course, a strong bias towards centralized IT in the pool. It should be noted, however, that although the Framework specifically advocates company-wide participation in IT decision making, it makes no assumptions regarding the official IT organization structure. There is no empirical evidence to indicate whether participative decision making is easier or harder to achieve when IT is centralized, and an *a priori* case for either view could be argued.

3. The Internal Planning Environment

Table 6 shows the number and percentage of respondents in the Business and the IT domains who state that the listed planning elements exist in their companies, and the number of responses (out of 21) where the replies differ.

The number of differences is remarkable - in the first place, the listed factors are all observable phenomena which are not usually subject to interpretation; in the second place, the respondents are all Types B and C in companies where IT is predominantly centralized, i.e. they presumably work together in a single forum of strategic IT decision making. Inspection of the underlying data reveals that nearly a third of the 21 pairs of respondents differ on more than 5 of the 16 items.

The occurrence of these differences cannot be associated with business sector or organization structure, on the basis of the available data. For example, 48 of the 84 differences occur in the Finance sector, which is not inconsistent with the distribution of responses shown in Table 2. Nevertheless, it is clear that there are significant communication gaps between business and IT decision makers in this pool. They occur on a scale that indicates a market in need of a decision making Framework that promotes better management of assumptions and data.

The high rates of Yes responses to "Formal corporate planning exists" (Question 12), "IT decision making process exists" (Question 13), "Corporate and IT planning interact" (Question 14), "A documented IT strategy exists" (Question 21) and "Senior IT steering committee exists (Question 22) suggest that many companies in this market are already attempting to put some structure into their strategic problem solving activity, both corporate and IT. Interestingly, more business respondents than IT respondents believe that an "IT decision making process exists" (Question 13).

It should be noticed, on the other hand, that where the Yes rate is lowest - "IT costs cycle exceeds 1 year" (Question 15), "IT strategic benefit is measured" (Question 16), "Operations costs are charged back" (Question 19), "IT liaison posts exist" (Question 23), IT R&D/technology posts exist" (Question 24) and "Business analysts/IT O&M posts exist" (Question 25) - the number of differences is high, except for (Question 15), so that it is doubtful whether these elements exist even to the extent indicated. Yet these are just the elements one would expect to find in place in companies with well developed strategic IT decision making processes - a firm grasp on measurements at the aggregate level, sophisticated communication mechanisms, and a tight linking of information systems and organizational processes. These observations suggest three further decision making needs: help in identifying and quantifying those elements of IT strategy that are in fact measurable, help in structuring and inter-linking appropriate decision making roles, and help in better matching information systems to the jobs and processes they are intended to support.

If, as a number of business respondents believe, "IT expenses grow faster than sales" (Question 17), while few believe that "IT strategic benefit is measured" (Question 16), then a feature of the Framework that should find favour is its integration of Porter value chain analysis and competitive advantage calculations into application portfolio planning. To this end, companies need to give more attention to business analysis and IT-orientated O & M studies than the responses to "Business analysts/IT O&M posts exist" (Question 25) indicate.

Finally, given the difficult South African planning environment, much more attention needs to be given to IT R&D and technology management, in the manner proposed in the Framework, than the responses to "IT R&D/technology posts exist (Question 24) indicate.

4. Strategic Issues Management

Since no respondents volunteered additional issues in the space provided for this purpose (Questions 58 to 61), it must be assumed that, for this pool, Table 7 covers all the important strategic IT issues. It will also be seen that most of these are indeed deemed by the respondents to be important - the only issues not rated more than 5 for importance by at least two-thirds of any of the three Types are:

29 "Cooperating with CUC, CSSA".
30 "Cooperating with SAPO".
36 "Inter-organizational systems".
37 "Exploiting new technologies".
47 "Buy Rather than make software".

It is important to realize that, besides "Disaster and security plans" (Question 28) and "Vendor relations and supply" (Question 31), these are precisely the areas in which one would expect outward-looking decision makers intent on managing their company's IT planning environment to be actively engaged. It should also be noted that, while "Shorter application lead-time" (Question 39) is rated more than 5 for importance by the majority of all three Types of respondent, an important means of achieving this, viz. "Developing IT infrastructure" (Question 38), is rated this important by barely two-thirds of the IT respondents and only half the business respondents. One may conclude that in many companies a fair degree of education and marketing will be required before the principles of interactive planning and idealized design advocated in the Framework (Section 4.1.III.) will be understood and accepted. This in turn should help managers grasp the idea of a target environment architecture as a basis of IT strategy, which the Framework also advocates.

Two-thirds or more of the IT respondents give importance ratings of more than 5 to all the issues except the 5 listed above, and there are only two items where significantly less than two-thirds of either of the business Types concurred. The first is "Developing IT infrastructure" (Question 38), which has already been referred to, and the second is "Reduced paper handling" (Question 43) where, surprisingly, far fewer Type B respondents than Type A respondents seem to feel strongly about the importance of the issue.

In general, it can be concluded that in this pool the business and IT respondents are reasonably in accord as to what the important strategic IT issues are.

With regard to how well the issues are believed to be be managed, a strong bias to the right is evident in most of the percentage distributions of the Poorly/Well scales. The only issues where appreciably less than two-thirds of relevant respondents (i.e. those rating the importance of the issue more than 5 for importance) give zero or positive scores are the following:

33 "Measuring the IT contribution"
37 "Exploiting new technologies"
38 "Developing IT infrastructure"

39 "Shorter application lead time"
42 "Organization adapted to IT"
43 "Reduced paper handling"
47 "Buy rather than make software"
48 "Managing IT human resources"
49 "Project cost/benefit/risk"
50 "Measuring IT effectiveness"
51 "Include IT in business plans"
53 "Controlling overall IT costs".

Questions 37, 38, 39, 42, 43, 47 and 48 are related to the creation of organizational capability through IT. Negative scores may indicate a need for better understanding of what a "strategic business system" (as defined in Section 4.3.III.B.1.) entails for companies hoping to develop distinctive strategic competence based on IT.

With regard to Question 37, none of the distributions shows a strong bias one way or the other. This result, considered together with the relatively low percentage of respondents who rate the issue more than 5 for importance, suggests that many companies in the pool may not yet have developed a vigorously entrepreneurial attitude to the opportunities offered by IT. This impression is confirmed in Table 10, by the high rates of disagreement with "IT can alter company objectives" (Question 68) and "Exploit any feasible IT opportunity" (Question 75).

Questions 33, 50, 51 and 53 refer to way the company takes IT and its quantifiable benefits into account in its business plans. Negative scores may indicate a need for better understanding of the potential impact of IT on the business strategy and the ways in which this can be measured.

It appears, on the whole, that in this pool the business and IT respondents are reasonably in accord, not only as to what the important issues are in strategic IT decision making, but also as to how well (or poorly) they believe the issues are being managed in their companies. Inspection of the underlying data reveals very few issues where the absolute difference of opinion between a business respondent and the IT respondent in the same company is greater than 1. The only issues where more than 5 of the responding companies show such large differences are:

33 "Measuring the IT contribution"
49 "Project cost/benefit/risk"
50 "Measuring IT effectiveness".

5. Ranking the Strategic Issues

Tables 8 and 9 show how the strategic issues rank in importance (1 is high, 30 is low) according to the respondents in the pool, and how these ranks compare with the results of a survey of senior IT executives and corporate general managers in the U.S.A. [Brancheau & Wetherbe, 1987].

In Table 8, the ranks are assigned according to the average of all the importance ratings submitted (1 to 10) per issue, per respondent Type, and per business sector (Financial vs. Other).

Clearly, the reasonable accord between business and IT perceptions that is apparent in Table 7 does not carry through to Table 8. The differences here are many and varied, and they certainly provide food for thought. Because of the sparseness of the data and the informality of the ranking process, however, it would be dangerous to draw far-reaching conclusions from them.

The overall impression given by Tables 7 and 8 is encouraging. It suggests that companies wishing to adopt a more structured approach to IT decision making, such as that proposed in the Framework, need not spend very much time in identifying the issues, since these are already largely agreed on. They can move briskly on to structuring them for debate, determining their relative urgency and evaluating their potential impact on IT strategy (Section 4.2).

Table 9 compares the South African ranks with the American, which were derived from a Delphi survey that took place about two years earlier than the questionnaire survey of the present Study. The comparison is thus not strictly valid, and once again care must be taken in drawing conclusions. Nevertheless, two of the apparent differences between the American and South African ranks call for comment.

Firstly, the Table indicates important differences in management assumptions, as between the two countries, and thus confirms the need for caution when studying overseas business and IT literature (Section 2.V.). For example, there is no comparable American ranking for "MIS/decision support" or "Operational quality", perhaps because these are now taken for granted by the American respondents and hence are no longer regarded as strategic issues. They are still ranked very high by the South African respondents.

Secondly, with two notable exceptions ("Competitive advantage" and "Organizational learning") the five highest South African ranks go to issues typical of alignment IT strategy (Section 4.3.I.) - "Operational quality", "Security", "Data as a corporate resource", "Multi-vendor integration", "MIS/decision support", "Software development", "Human resources". It may well be that that these ranks reflect a conservative attitude to IT planning that is appropriate in the South African planning environment, where factors such as the availability of human skills and reliability of technology supply introduce far more uncertainties and risks into IT strategy than in, say, the U.S.A. It is tempting to believe that the importance many South African respondents seem to attach to "Competitive advantage" is tempered by a healthy regard for the issues of "Organizational learning", such as the implications of "stages of company development" for successful IT strategy (Section 4.6.III.). Few, however, of the business respondents and less than one would expect of the IT respondents report much familiarity with Nolan's Stages Theory (Question 116 in Table 13).

The highest American ranks largely go to the issues that are characteristic of impact IT strategy - "Strategic planning", "Competitive advantage", "Organizational learning", "IS's role and contribution", "Place of IS in the organization", "End-user computing" - while traditional items like "Office automation" and "Decision support" no longer rank in the first 20.

From the above discussion, there appears to be good reason to believe that an appropriate Framework for strategic IT decision making in South Africa muss emphasize two facts: that successful strategy formulation depends critically on the awareness and competence of the decision makers, and the quality of the dialogue between the business and IT domains (Section 4.2.I.); and that successful strategy implementation depends critically on the planning and carrying out of feasible transition stages (Section 4.5.II.).

6. Importance and Quality of IT Decision Making

It can be seen in Table 10 that for 8 out of the 14 elements of strategic IT decision making shown (Questions 62, 63, 64, 65, 66, 69, 70, 74), more than two thirds of each of the three Types of respondent agree on the importance - very often, they strongly agree. Moreover, except for Question 68 and possibly Question 67, the distributions of the business responses are very similar to those of the IT responses.

Such strong agreement on "Survival depends on existing systems" (Question 62), "Survival depends on new systems" (Question 63) and "Operational planning is critical" (Question 64) suggests that these respondents believe their companies to be in the "strategic box" of McFarlan's Grid (Section 4.3.IV.A.). Inspection of the data underlying this Question reveals that the belief pervades all the business sectors listed in Table 3. This being so, one could perhaps have expected a greater measure of disagreement with "IT does not constrain company goals" (Question 67) than the Table in fact shows.

It is difficult to reconcile the high rates of approval for "IT strategy must be long term" (Question 65) and "Build infrastructure before systems" (Question 70) with the relatively fewer responses in which "Developing IT Infrastructure" (Question 38) is rated more than 5 for importance, as shown in Table 7. Possibly, as with "Organizational learning" (Table 10), respondents recognize the issue but are unsure about what is involved - hence also the considerably lesser degree of enthusiasm that is evident for "Base strategy on a target environment" (Question 71). Indeed, the responses to "Build infrastructure before systems" (Question 70), "Base strategy on a target environment" (Question 71) and "Implement IT strategy incrementally" (Question 72), taken together, indicate the need for much education and marketing before the Framework's concept of "directed incrementalism", on which the implementation strategy of a target environment architecture hinges, will be accepted.

The responses to "Good business/IT dialogue is critical" (Question 66) and "Strategic IT decisions must be formal" (Question 69) indicate that many respondents already recognize the importance of good, formal dialogue among business and IT decision makers, or "good dialectic" to use the terminology of the framework.

The high rates of agreement with "Base IT strategy on business strategy" (Question 74) and of disagreement with "Exploit any feasible IT opportunity" (Question 75) are not unexpected. They indicate the focus on alignment IT strategy discussed in the preceding Section and, possibly also, a level of caution in the difficult South African planning environment.

The relatively high rate of disagreement with "Involve many people in IT decisions" (Question 73) can be interpreted in two ways. It could indicate a valid concern that participants in strategic IT decision making should be carefully chosen (Sections 4.2.II. and 4.4.V.). On the other hand, it could indicate a failure to recognize that intuitions leading to strategic IT opportunities can arise at any level of the organization and in any quarter.

The relatively high general level of agreement among the three respondent Types that is evident in Table 7 does not carry through to Table 10. Inspection of the underlying data reveals that for six out of the 14 questions, there are more than 5 companies where the absolute difference of opinion between a business respondent and the IT respondent in the same company is greater than 1 - i.e. Questions 67, 68, 71, 72, 73 and 75. For two of these questions, the number of companies with such differences of opinion is remarkable:

67 - "IT does not constrain company goals" - 12 out of the 21 B/C pairs

72 - "Implement IT strategy incrementally" - 10 out of the 21 B/C pairs.

In both questions, it is most often the Type C respondent who disagrees with the assertion and the Type B who agrees.

Table 11 shows the distribution of responses to Questions 76 to 91, all of which refer to the quality rather than the importance of strategic IT decision making in the company. These results should be compared with those shown in Tables 7 and 10.

For example, as far as Types A and B are concerned the level of disagreement with "Little or nothing done about environmental risks" (Question 76) is consistent with their responses to "Disaster and Security Plans" (Question 28), as reflected in Table 7. The apparent inconsistency of the two distributions for Type C is noteworthy. 93% disagree with Question 76, i.e. they do not agree that they are doing little to cover themselves against environmental threats, but only 54% agree with Question 28, i.e. that contingency plans against environmental threats are well managed in the company. This may be an indication that many

IT managers believe they are doing the best they can but are not getting good enough support from the business domain. If this is so, then careful environmental analysis performed jointly by business and IT decision makers, as proposed in the Context component of the Framework (Section 4.2) would be well justified.

Only a third of all respondents agree with "No business direction to IT planning" (Question 77), while even fewer agree that "IT managers have a poor grasp of business" (Question 78). On the other hand, most respondents believe that "Few non-IT people understand IT" (Question 86). If these perceptions are correct, then there is little ground for advocating that business still "needs a new breed of DP manager". There is, on the contrary, good reason to believe that joint IT decision making based on either the "communication" or the "mutual understanding" position (Section 4.4.V.B.3.) has every chance of succeeding.

It has been seen that all three Types of respondent are strongly in agreement with the strategic importance of both new and existing systems and with the criticality of good operational planning (Questions 62 to 64 in Table 10). Less than two thirds, however, agree that their operational systems meet objectives, and even fewer believe that their companies already have all the necessary systems in place (Questions 79 and 80). The concerns that underlie these responses may well be the reason for the high ranks of "Operational Quality", "MIS/Decision Support and "Applications Portfolio" that emerge among South African respondents in Table 9. On the other hand, it should be noted that very few respondents believe that their companies lag behind the rest of their respective business sectors (Question 87).

There is no overwhelming tendency one way or the other in respect of respondents' perceptions of the goodness of fit between application systems and the jobs they support (Question 81), which is consistent with their responses to "Office/Factory Automation" (Question 34) and "Organization Adapted to IT (Question 42), as reflected in Table 7. This suggests a possible need for some such unifying concept as the Framework's definition of a "strategic business system", which tightly links the applications portfolio to the Porter value chain (Section 4.3.III.B.1).

"The IT team is stable" (Question 82), "The IT managers are competent" (Question 83), "IT technical staff are competent" (Question 84) and "Few systems failures in recent years" (Question 85) all refer to the "baseline" issue - is the IT function of the company capable of carrying out its IT strategies? For the most part, respondents appear to agree that this is so in their companies. Not surprisingly, however, fewer business than IT respondents agree that the IT team is stable. Interestingly, while fewer business than IT respondents believe that the technical staff are competent, most business respondents believe that their companies possess the necessary skills to engage in inter-organizational systems (Question 88).

The distributions of responses to "IT contribution effectively measured" (Question 90) are not entirely consistent with those of the responses to "Measuring the IT contribution" (Question 33), as reflected in Table 7. The apparent uncertainty here, as well as in regard to "Satisfactory investment in IT R&D" (Question 89) and "IT effectiveness is measured" (Question 91) may indicate a need for procedures and criteria with which to evaluate and monitor the overall IT investment (Section 4.5.IV.). The importance attached to this issue is indicated by the large percentages of ratings greater than 5 in respect of "Project cost/benefit/risk" (Question 49), "Measuring IT effectiveness" (Question 50) and "Controlling overall IT costs" (Question 53), as reflected in Table 7.

Inspection of the underlying data reveals that for 11 out of the 16 questions of Table 11, there are more than 5 companies where the absolute difference of opinion between a business respondent and the IT respondent in the same company is greater than 1 - i.e. all questions except 82, 83, 84, 85 and 88. For no question, however, are there more than 9 such companies.

Table 12 shows respondents' views regarding the location of IT decision making in their companies, and there is an overall impression of much centralization. Remarkably, inspection of the underlying data reveals no significant differences between the distribution of responses from companies where IT organization is decentralized and those where its is centralized.

Almost without exception, "Selecting mainframes" (Question 92), "Selecting mainframe software" (Question 95) and "Deciding mainframe capacity" (Question 103) are Very Centralized. This is not surprising in view of the relatively low incidence of costs charged back, as shown in Table 6 (Questions 18 and 19), and the fact that user accountability for capital expenditure is much rarer in practice than user responsibility for computer running costs. It does suggest, however, that most companies in the pool have some way to go before participation in formulating overall It strategy (Question 107) can carry with it a meaningful responsibility for controlling the overall level of IT expenses. This control requires the linking of capacity planning to computer cost charge-backs. The critical link is the capital budget (Section 4.5.III.B.), and involving more people in "Forecasting capacity needs" (Question 105) can help in establishing it.

The beginnings of a trend towards decentralization is discernible in all the applications-related issues: "Selecting application packages" (Question 96), "Planning the database" (Question 97), "Selecting application systems" (Question 98) and "Planning application systems" (Question 99). Once again, inspection of the underlying data reveals that IT organization has little to do with the matter - in fact the few perceptions of Very Decentralized that emerge do not all come from companies with a decentralized IT organization.

Inspection of the underlying data of Table 12 reveals that for 6 out of the 15 questions there are more than 5 companies where the absolute difference of opinion between the business respondent and the IT respondent in the same company is greater than 1 - i.e. questions 96, 98, 99, 100, 102 and 105. For no question are there more than 8 such companies.

7. Decision Making Tools and Techniques

Of the 35 tools and techniques listed in Table 13, only the following 14 have at least been tried by at least half of at least one of the respondent Types (which are indicated):

108	Brainstorming	A	B	C
109	Business strategy model		B	C
110	Business Systems Planning (BSP)		B	C
111	Cost/benefit evaluation model		B	C
112	Critical Success Factors Technique			C
113	Environmental scanning		B	
114	Feasibility studies	A	B	C
115	Financial modelling	A	B	C
116	Nolan Stages Theory			C
118	PERT, Critical Path, etc.	A	B	C
121	Project management systems	A	B	C
122	Service level agreements	A	B	C
132	Change management processes			C
142	Priority setting methods	A		C

In each of the instances where Type A does not show, with the sole exception of cost/benefit evaluation, roughly two thirds or more of these respondents have either never heard of or never tried the tool or technique. Where Type B does not show, about two-thirds or more of these respondents have either never heard of or never tried it. Nearly 60% of the Type C respondents have never heard of or never tried environmental scanning. Nolan's Stages Theory and Rockart's Critical Success Factors Technique appear to be all but unknown to the business respondents.

One may conclude that the range of strategic IT decision making tools and techniques with which respondents seem to be familiar is limited and consists mostly of the old and the conventional. The few modern techniques that do appear seem to be much less familiar to the business participants in decision making than to the IT participants. The few techniques apparently known to Type A respondents are not particularly IT-orientated.

With regard to the apparently lesser known techniques, the following should be especially noted:

The majority of respondents have never heard of Nominal Group Technique (Question 117), and almost none have tried it. By inference, dialectical enquiry can be assumed to be equally unknown. Given the popularity of brain storming (Question 108) and the requirement for more formality in IT decision making (Question 69 in Table 10), however, the Framework's proposal for the use of dialectical enquiry (Section 4.2.III.) may be marketable.

Few respondents have heard of or tried Porter "strategic forces" (Question 119) or "value chain" analysis (Question 120). Hence the Framework's adaptation of Wiseman's "strategic option generator" (Section 4.3.) and its integration of value chain analysis into application portfolio planning (which has already been referred to in the context of Questions 16 and 17) should provide practitioners with the fresh insights intended. There also appears to be little familiarity with other analytical approaches to application requirements definition, e.g. strategy set transformation (Question 123), BIAIT (Question 128), BICS (Question 130), and Customer Resource Life Cycle (Question 133). Even IBM's BSP (Question 110) and South Africa's own Tetrarch (Question 124) appear to be less well known than one might have expected. The relative lack of familiarity with application portfolio approaches (Questions 127 and 141) should also be noted.

Techniques and approaches such as B+OL+D (Question 129), EwIM (Question 135) and innovation management (Question 137), which are geared to company-wide development of IT capability, appear to be relatively unknown. This could be part of the reason why concepts like "Developing IT infra-structure" (Question 38 in Table 7), "Base strategy on a target environment" (Question 71 in Table 10), and "Implement IT strategy incrementally" (Question 72) gain relatively low support. Given respondents' agreement, in spite of the above, that IT infrastructure is a matter of strategic capability that can and should be addressed before application systems, the Framework's advocacy of an incrementally implemented target environment architecture (Section 4.4.) may be both novel and marketable.

Taken overall, Table 13 shows that respondents make little or no use of many of the tools and techniques that are specifically intended to help strategic IT decision making in the new perspectives described in Chapter 2. Part of the reason for this is, of course, the fact that many respondents are not yet aware of the new perspectives, as has been seen in Tables 7 to 12.

8. The Success of IT Decision Making

Table 14 summarizes the distributions of responses relating to the perceived success of strategic IT decision making in the companies concerned. Two broad areas of success are shown, Decision Product (Questions 143 to 149) and Decision Making Process (Questions 150 to 154).

As in Table 7, a strong bias to the right is evident in most of the percentage distributions of the Poorly/Well scales.

For all Product Outcomes, at least two-thirds of all respondents give their companies zero or positive scores. It appears, therefore, that most respondents are reasonably satisfied with their success in achieving their IT decision making goals. The justifiability such widespread optimism can, of course, be questioned, in view of the apparent difficulty many companies have in measuring the benefits of their IT investments - see, for example, Questions 15 and 16 in Table 1, Questions 33 and 49 in Table 7, and Question 90 in Table 11.

The only Process Outcomes where appreciably less than two-thirds of respondents give their companies zero or positive scores are the following:

150	"Co-ordination/consensus"	C
151	"High quality dialogue - strategic"	C
153	"Quick response to needs"	A B C
154	"High quality dialogue - operational	A B

The overall picture in this part of the Table is one of modest satisfaction with the existing decision making processes, with indications of room for improvement in areas the Framework has been designed to address. Moreover, in only two questions (147 and 154) are there more than 5 companies where the difference of opinion between a business respondent and the IT respondent in the same company is greater than 1.

9. The Purposes and Uses of IT

As can be seen from the response rates in Tables 15 and 16, most respondents made the effort to work through an undoubtedly laborious section of the Questionnaire - almost all got through the questions relating to IT purposes (Questions 155 to 171), and almost as many carried on through the questions relating to IT uses (Questions 174 to 180). This level of perseverance could be an indication of respondents' agreement that the two central issues of strategic IT decision making are indeed: understanding and agreeing the purposes of IT in company strategy; and understanding and agreeing the uses to which IT can be put in serving those purposes. Everything else in strategic IT decision making is aimed either at achieving this understanding and agreement or at giving successful effect to them.

Table 15 shows the average and maximum importance ratings of various strategic purposes, separately per respondent Type and per business sector. Transport has been left out in order not to compromise the confidentiality of the single responding company in this sector. The ranks are based on average scores and should be interpreted only as very broad indications of the perceived priorities, i.e. no great significance should be attached to ranks that differ by only a few places. The "How Exploited Scales" have not been analyzed in this Study, since they were not entered with sufficient regularity for meaningful comparisons to be made.

Two things can be noticed immediately: firstly, the purposes with the highest importance ratings (those ranked 1 to 6, say) are quite different in the four sectors; secondly, in Finance and Oil there is a large measure of agreement as to what the most important purposes are, which is not apparent in the other two sectors.

> Finance: For all three respondent Types, "Add value to our product" (Question 155), "Tie customers to us" (Question 156), "Become low-cost leader" (Question 157), "Distinctive product/image" (Question 163), and "Organizational effectiveness" (Question 164) rank in the first six. For Types A and C, "Block existing competitors" (Question 165), and for Type B, "Block new entrants - complexity of product" (Question 167), rank in the first six,
>
> The high ranks simultaneously given to "Add value to our product", "Tie customers to us" and "Become low-cost leader" raise the question as to whether respondents have sufficiently thought through the incompatibilities of product/service differentiation and price/performance leadership strategies, and the risk of being "stuck in the

middle", as Porter [1980: 41] puts it.

Moreover, one would have expected the high ratings of "Add value to product" and "Tie customers to us" to have been accompanied by similarly high ratings for the "Discourage substitutes" Questions (i.e. 169 to 171), but this emerges only for Type A. One must therefore wonder whether respondents have given sufficient thought to the changes in product and market boundaries that are taking place <u>within</u> the financial sector, and the implications of these for the strategic purposes of IT in their companies.

<u>Oil</u>: Interestingly, the overall picture for Oil is not very different from that of Finance. The only differences in the six highest ranking purposes are: for Type A, "Block new entrants - exclusive alliances" (Question 168) and "Discourage substitutes - price/performance" (Question 170) rank instead of Questions 156 and 165; for Type B, "Discourage substitutes - price/performance" (Question 170) ranks instead of Question 168. For Type C, the top six are the same.

<u>Industry</u>: The overall picture is quite different from that of any other sector, and there is little consensus across the three respondent Types. The only purpose ranking in the top 6 for all Types is "Suppliers conform to us" (Question 160), which does not rank in the top 6 in either Oil or Finance and only for Type B in Retail.

For both business Types, the most important purpose by a fair margin is "Organizational effectiveness" (Question 164), which did not rank in the first 6 for Type C. For the latter, the top ranking purpose is "Suppliers conform to us."

<u>Retail</u>: Once again, the picture is quite different from that of any other sector. There are two purposes that rank

in the first 6 for all three respondent Types: "Add value to our product" (Question 155) and "Distinctive product/image" (Question 163). This is the top ranking purpose for Type A, while for Types B and C the top ranker is "Organizational effectiveness" (Question 164).

The clear message of Table 15 is that decision makers in different industries have different views of the strategic purposes of IT, and often decision makers in the same company will differ. Moreover, a given decision maker's views will no doubt change as circumstances change. Since strategic purpose is the core concept in strategic IT decision making, it follows that no one decision making framework can be specified in detail that will be equally suitable for all companies and industries at all times. The principle of contingency (Section 4.1.III.D.3.) that underlies the present Framework is, therefore, appropriate, as is the insistence on dialectical debate, incremental implementation, and learning and adaptation.

Each row in Table 16 shows the numbers of respondents who rated the relevant strategic purpose more than 5 for importance and indicated that it was best served by the corresponding uses of IT (columns A to G). Although Table 16 is only sparsely populated, several important observations can be made.

Firstly, the column totals can be considered as "votes" for each of the seven uses. It will then be seen that the most popular strategic uses of IT vary according to business sector:

Finance: For both the business and the IT respondents, the most popular uses are "Automation of office processes", "Inter-organizational systems", "Automating the client interface" and "Management information/decision support".

Industry: For both the business and the IT respondents, the most popular use is "Automation of office processes". For the IT respondents, "Management information/decision support" ties for first place, while for the business respondents second place goes to the not very different "Professional support".

<u>Oil</u>: For the business respondents, the most popular use is "Automation of office processes", while for the IT respondents it is, interestingly, "Automating the client interface."

<u>Retail</u>: For both the business and the IT respondents, the most popular uses are "Management information/decision support" and "Automating the client interface".

Respondents' emphasis on "Automating office processes" and "Automating the client interface" is not inconsistent with the South African ranking of the issues in Table 9. It lends credence to the Framework's focus on complete business systems, as contrasted with management information systems. This orientation will be seen both in the "inside vs. outside the system" dimension of the decision maker framework (Section 4.2.II.B.), and in the strict definition of a strategic business system as a tight coupling of information (application) systems and human (organizational) systems (Section 4.3.III.B.1.).

On the other hand, the emphasis on "Inter-organizational systems" in Finance is not at all consistent with the low percentage of Finance respondents who rated such systems more than five for importance in Question 36 (Table 7) (as revealed by inspection of the underlying data).

Subject to the uncertainty indicated by such inconsistencies in the responses and also to the sparseness of Table 16, the latter does provide some sort of indication of respondents' approaches to application opportunity selection. For example, in the Finance Sector, the votes of both business and IT respondents for "Automating office processes" suggest that this is where they believe the competitive weapons for "Become low-cost leader" and

"Organizational effectiveness" will be found. For "Add value to our product", they will probably be found in "Professional support" and "Automating the client interface".

It can also be seen that the perceived match between purpose and use varies to some extent according to business sector and decision making domain. With more data, it should be possible to develop well grounded guidelines for the fourth and fifth steps of the "strategic option generator" (Section 4.3.III.B.2.).

IV. CONCLUSIONS

Specific conclusions have been drawn during the discussion of the Tables in the preceding Section, although most of them are only tentative in view of the sparseness of the data. They will now be summarized in terms of the survey aims set out in Section 3.II.B.2.

What is currently being done to manage the strategic IT decision making process in South African companies?

> From Table 6 it appears that many of the accepted strategic management processes are already in place in responding companies. The differences between the perceptions of the business and the IT respondents raise some doubt as to how effective these processes sometimes are, while the high incidence of centralization reflected in Tables 2 and 12 suggests that participation in them is often not wide.
>
> Table 13 clearly shows that most respondents do not use many of the tools and techniques that are available to help in strategic IT decision making. Those used tend to be conservative and were not designed to encourage aggressive approaches to the exploitation of IT in business strategy. Little familiarity is evident with McFarlan's adaptation of Porter's competitive strategy analysis to IT planning, or with Nolan's contribution to organizational IT learning.

Do respondents believe they are doing it successfully?

Table 7 shows what respondents apparently regard as the important strategic issues. For the most, their views are that the issues are well managed in their companies. Among the exceptions are those issues that relate to the creation of strategic capability through IT, which is consistent with respondents' apparent lack of familiarity with many of the relevant tools and techniques.

Table 14 gives an overall impression of modest satisfaction with what respondents believe their companies are doing.

What more should be done, and what support do decision makers need?

Table 6 shows a requirement for better quantification of the costs and benefits of strategic IT applications, while Table 7 shows the need already referred to for better approaches to creating strategic IT capability. Table 7 also shows that most respondents perceive their current business/IT dialogue and IT management skills to be just adequate. These three factors together can be taken as indicative of a need for better linking of decision maker competence and company strategic competence in the manner proposed by the Framework.

Table 11 shows a number of specific aspects where the quality of strategic IT decision making needs improvement. One difficulty, from the point of view of the proposed Framework, is that respondents appear to be unaware of some of the most urgent requirements - for example, more broadly based participative IT decision making, more attention to the goodness of fit between the competitive purposes and the organizational uses of IT, and a better understanding of what constitutes superior performance in applying IT to business strategy.

Certainly, Table 13 shows that many respondents are unaware ~~aware~~ of significant decision making tools and techniques that are already available, and where these fit into the overall strategic IT decision making process. Better awareness would undoubtedly lead to a richer appreciation of strategic possibilities than is reflected in Table 16.

How do South African attitudes differ from overseas?

Certain major differences between American and South African attitudes are shown in the ranks of Table 9. A similar comparison between South African and British or European attitudes was not attempted in the present Study.

The most obvious differences are the considerably higher priorities given by South African respondents to human resources and security and control.

The Table also suggests that there are other important differences between the assumptions of the American decision makers and those of the South Africans. The information systems function's role, contribution and placement in the organization rank more highly among the American respondents, which is consistent with their high ranking of strategic planning and competitive advantage. With the exception of the anomaly of their ranking of competitive advantage as already discussed, the apparent South African priorities are more conservative than the American, and the IT respondents are even more conservative than the business respondents.

What generic concepts, processes, techniques and tools should the strategic IT decision making Framework include?

Several conclusions about needs the Framework may fulfil have been drawn in the course of the discussion of the Tables. The following are additional observations.

Two apparent gaps in current strategic IT management thinking that the Framework may address can be seen in Table 6: more attention to IT-orientated organizational planning, and the inclusion of IT-orientated research in the corporate planning processes.

Table 7 and the ranks in Table 9 suggest a requirement for much education regarding the concept of impact IT strategy, where IT is used to reshape the goals and strategies of the enterprise, and to the concept of organizational IT learning, through which decision makers come to understand how such reshaping can be an appropriate and feasible extension of their business strategy.

A point that must be made in this regard is that a misunderstanding of what Peters and Waterman [1982: 292] meant by "sticking to the knitting" could kill many creative proposals for IT-based strategies. To stay within the scope of decision maker and company competence does not necessarily mean that the scope must be restricted. On the contrary, uses of IT that extend the scope of competence in decision making and task performance are precisely those that will extend the strategic competence of the company.

At the same time, the strong positive responses given to all the "McFarlan strategic grid" questions of Table 10 suggest a lack of sufficient insight into the nature of a company's strategic dependence on IT, how this varies with circumstances, and how the IT positioning of the company should vary accordingly.

Will the Framework be judged useful? What can be done to improve its "genericness"?

The low response rates to the questionnaire survey shown in Tables 1 and 2, and the general unfamiliarity with modern tools and techniques shown in Table 13, are certainly not encouraging signs.

On the other hand, there is at present no tool, technique or methodology available in the South African market that covers the content, structure and process of strategic IT decision making comprehensively (as Tapscott, Greenberg & Henderson's "strategic framework for integrated office systems", Nolan, Norton & Company's "computer architecture strategic planning" [Advanced Systems Inc., Courses 3947 & 5055] and Benjamin's [Seminar E-01] "B+OL+D" methodology taken together do). There is none that assists in exposing and synthesizing decision makers' assumptions (as Mason & Mitroff's [1981] "dialectical debate" and Delbecq & Van de Ven's [1975] "nominal group technique" do). And there is none that places the formulation and implementation of IT strategy into the context of organizational development and organizational learning (as the Nolan, Norton and Company consultancy does).

Consequently, a decision making Framework aimed at bringing the best of all these techniques to bear in an orderly manner should, if appropriately presented, be found useful by people charged with the responsibility to vitalize the IT decision making processes of their companies. It has been established that skilled facilitators for the "principal disciplines" of all Components of the Framework (Section 4.6.II.) are available in South African companies, consultancies and Universities.

If Table 17 is to be believed, interest in the issues raised by the survey is reasonably high since, except for Type B respondents in non-financial companies, not much more than a third of the respondents found the task of completing the questionnaire tedious. On the other hand, the number of respondents who claimed to have gained few new insights by doing so is remarkably high, considering the results reflected in, say, Table 13.

> As regards improving the genericness of the Framework, several remarks have been made about what could be done if more data were available. In particular, since Table 15 shows that the perceived strategic purposes of IT are highly contingent on circumstances, an industry-specific opportunity generator grounded in good data would be a valuable addition to the arsenal of tools and techniques

With regard to objective B of the Study, the overall conclusion that can be drawn from the opinion survey is that many, if not most, of the respondents have already made progress in coming to terms with the important issues of strategic IT decision making and are, in general, modestly satisfied with the results obtained. There remain, however, many areas where additional support is required to improve the quality of the decision making, particularly from points of view characteristic of the new perspectives of IT strategy and infrastructure described in Section 2.II.B.

There is much diversity of perceptions, opinions and beliefs among the respondents. As regards objective D of the Study (Chapter 5), it is clear that evaluating the Framework for acceptance into a company, deciding on its aims and priorities, and getting decision making going in terms if it, will also be complex problems. The requirements will vary according to business sector, as between companies in the same business sector, and probably also, at least initially, as between domains in the same company. It is also clear that the South African priorities will not be the same as those presupposed in the overseas literature.

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CHAPTER 4

THE THEORETICAL FRAMEWORK

4.1 OVERVIEW AND DESIGN PRINCIPLES

I. INTRODUCTION

The four objectives of the Study are stated in Section 1.III. The theoretical Framework for strategic IT decision making described in this Chapter is aimed specifically at the third objective:

C. To propose a new approach to strategic IT decision making that will help South African management deal with the fundamental issues underlying the environmental changes, and develop effective IT-based business strategies.

To help in understanding the logic of the Framework, this Section gives an overview, and an outline of the design principles.

II. OVERVIEW

A. Components and Parts

The Framework consists of the five Components shown in Figure 1, each of which consists of a number of Parts. The Components are based on Ackoff's phases of "interactive planning". Although there is a logical sequence to their presentation in this Study, they are in fact highly inter-related. In practice, a company will usually have several optional sequences of implementation.

"There is no way of putting the phases on paper without

> ordering them. This is unfortunate because there is no necessary order to them. They are interdependent aspects of a systemic process, each feeding and fed by the others, particularly in continuous planning. ... None of them, like the process as a whole, should ever be completed, and they may be started in any order." [Ackoff, 1981: 74]

For example, a move towards more formal IT decision making often begins with business managers' concern about rising levels of computer costs. IT managers often cite rising user demand for service and functionality as the reason for this. The first step towards a more formal approach might then be an improvement in the capacity planning and accounting processes (Decision Making Process). This step could lead to a restructuring of all the IT decision making roles and responsibilities in the organization (Decision Structure - Human Resources).

Examining the aims of different constituencies of decision makers could then lead to better understanding of the role of IT in the business strategy (Decision Content) and of the need to develop the company's IT capability (Decision Structure - IT Infrastructure). As understanding grows of the opportunities and inhibitors influencing IT strategy (Organizational IT Learning), more formal and detailed analysis of the IT planning environment could be called for (Decision Making Context).

1. Decision Making Context

This Component is described in Section 4.2. It is the first of the three that deal with the formulation of IT strategy. The external and internal environments of the company are examined to determine the strategic purposes and uses of IT. The Component corresponds to Phase 1 of interactive planning:

> "<u>Formulating the mess</u>: the system of threats and opportunities that face the organization." [Ackoff, 1981: 74]

There are three Parts to this Component:

Identifying the IT decision making domains in the company, and their significance in the organizational dialectic.

A dialectical enquiry process that accepts and exploits the inevitability of conflict and contradiction in IT planning, and of a fundamental relationship between dialectic and development.

> "Good dialectic is not a matter of smoothness of operation or elimination of error. On the contrary, its goodness is inherent in the ways in which error is continually interpreted and corrected, incompatibility and incongruity are continually engaged, and conflict is continually confronted and resolved." [Argyris & Schön, 1978: 146]

> "Where contradiction is at work, there is the force of development." [Cornforth, 1976: 54]

An approach to environmental data analysis that supports this process.

The product of this Component is one or more "Corporate IT Scenario(s)".

2. Decision Content

This Component is described in Section 4.3. It deals with the decision making involved in determining the role of IT in the company's business strategy. It corresponds to Phase 2 of interactive planning:

> "Ends planning: specifying the ends to be pursued. It is in this phase of planning that a desirable future is designed." [Ackoff, 1981: 74]

The Component has four Parts:

Defining the purposes that should be served by IT in the company's competitive strategy.

Defining the uses of IT in organizational design, and linking purposes and uses in the concept of a "strategic business system."

Stating the company's "IT positioning", which serves as a set of well-defined corporate constraints (policies, limitations, criteria) on the translation of purposes and uses into feasible IT strategy.

The IT strategy will have two distinct but interdependent elements:

An IT technology strategy, expressed in terms of an architecture for an ideal "target environment" in which the desired purposes and uses of IT would be fulfilled. The Structure Component deals with this element in detail.

An IT management strategy, expressed in terms of an organizational development, through which the Target Environment Architecture is implemented, incrementally and adaptively over time. The Process Component deals with this element in detail.

The product of the Content Component is the "IT Positioning Statement".

3. Decision Structure

Section 4.4. deals with the Structure Component. It describes the "structure" of a strategic IT decision in terms of an architecture that is required to guide the building of the target environment. This Component corresponds to Phase 3 of interactive planning:

> "Means planning: selecting or creating the means by which the specified ends are to be pursued. It is in this phase of planning that ways of approximating the desirable future are invented." [Ackoff, 1981: 74]

The Parts of this Component are the four dimensions of the Target Environment Architecture:

> IT Infrastructure: The generic structures and policies to be developed as infrastructure in anticipation of future strategic business systems.

> Human Systems: The organizational elements of strategic business systems - the generic structures and functions through which people commission, develop, use and operate IT.

> Information Systems: The technological elements of strategic business systems - the generic data resources and application systems delivered by the IT infrastructure to support the human systems.

> Human Resources: The generic decision making roles through which people bring competence (i.e. knowledge, skills and attitudes) to the decision making tasks, and accept responsibility for carrying them out successfully.

The product of this Component is the "Target Environment Architecture".

4. Decision Making Process

In this Component, described in Section 4.5, the focus shifts from the formulation to the implementation of IT strategy, i.e.

from IT technology strategy to IT management strategy. The Component covers Phases 4 and 5 of interactive planning:

> "Resource planning: determining what resources will be required, when they will be required, and how to obtain those that will not otherwise be available."
>
> "Design of implementation and control: determining who is to do what, when, and where; and how the implementation and its consequences are to be controlled, that is, kept on track." [Ackoff, 1981: 75]

There are three Parts:

> Identifying the cultural, political, organizational and technological changes needed to carry the company towards its target environment, and structuring them as strategic thrusts in a company-wide organizational development programme.
>
> Defining the medium-term and short-term plans needed to accomplish the strategic thrusts and transition stages.
>
> Co-ordinating and controlling the progress of the transition stages, which includes evaluating aggregate costs and benefits of the IT strategy and controlling the required resources on a company-wide basis.

The product of this Component is the "Master Transition Plan".

5. Organizational IT Learning

Organizational learning is implicit in Phase 5 of interactive planning, and is treated elsewhere in Ackoff's book. This Component, described in Section 4.6, deals with the creation of the learning systems a company needs to formulate and implement IT strategy effectively.

The Component has three Parts:

Analyzing the nature of organizational IT learning from several perspectives, in order to determine the important factors in the design of learning systems.

Identifying historical stages in company development, to ensure congruency between these stages and the planned transition stages of the IT strategy, and to ensure that the learning systems themselves develop as the company develops.

Synthesizing the company's organizational IT learning requirements into specific learning systems, both the development and use of which are imbedded in the transition stages. This includes systems for managing technology innovation and assimilation in the company.

A variety of learning systems and adaptive mechanisms constitute the product of this Component.

Figure 2 shows three kinds of Link that can arise among the Components and Parts of the Framework.

B. <u>Links</u>

1. Type I - Dialectic

In each Component and Part, these Links bridge the conceptual gap between the business and the IT decision making domains. They are called dialectic because the conceptual gap is a significant source of conflict (among decision makers) and contradiction (among decisions), and thus an important reference point for organizational dialectic. For example, decision makers in the marketing department usually push for early delivery of application systems, because they fear that market opportunities will be lost through delay. IT decision makers press for more time to ensure that the systems are well designed, programmed and tested. O & M specialists introduce yet another set of aims when they insist that additional time be taken to revise organizational processes and retrain workers in accordance with the new requirements. One way of resolving such conflicts is to combine the marketing planners, systems analysts and methods analysts into a single team, charged with the responsibility to identify, design and implement feasible business opportunities.

Similarly, an elaborate and expensive access control system may be the "right" technology for IT management purposes but not the "right" answer for business purposes as currently understood, which may simply require inexpensive dial-up access. One way of resolving the contradiction would be to extend the scope of the business to include the sale of value-added network services to other parties who also need them but cannot afford them on their own.

2. Type II - Contingency

These are the Links between one Component and another. They show how managing a given issue depends strongly on how issues in other Components are managed. Solving an IT strategy problem depends not only on business purpose (Decision Content), but also on the business environment (Decision Making Context), on the way the problem is analyzed (Decision Structure and Decision Making Process), and on the competence of the decision makers for the task (Organizational IT Learning).

For example, whether it is "right" to increase the information intensity [Porter & Millar, 1985: 153] of particular jobs, thus reducing the labour intensity, depends not only on the economics of the problem but also on the weights given to effectiveness (match with the product, market and technology assumptions of the company), profitability (match with the financial objectives of the company) and morality (acceptability in the social, political and economic environment) [Bower, 1982(2): 632].

3. Type III - Feedback

As the company becomes more dependent on the use of IT to sustain its competitive position, its strategic IT capability must be developed accordingly. The human and information systems, and the IT infrastructure that support these, must grow in their ability to respond to the demands being made on them. At the same time, the IT decision makers themselves must grow in their ability to manage increasingly complex tasks of organizational design and business strategy.

Prompt and effective resolution of conflicts and contradictions, i.e. good organizational dialectic, is the essential precondition for both kinds of development. Organizational IT learning is the process through which the quality of organizational dialectic improves.

Type III Links, shown in Figure 3, bring organizational IT learning into operation as the feedback of experience from current to future cycles of strategic IT decision making. The adaptation of IT strategies and plans resulting from such feedback takes place through the complementary processes of "organizational IT learning" and "incremental implementation". Both processes become feasible through the definition of "levels of discourse" (Section 4.1.III.D.4.).

C. Decision Packets

The Components, Parts and Links of this Framework emphasize decision making as a process, rather than decision taking at a moment in time. They support the point of view that strategic IT decisions are manufactured, over time and in a number of inter-related sets of actions, by managers with positive decisional roles, and with the use of a variety of decision making aids [cf. Minkes, 1987: 40-42].

The Framework thus provides a means of logically sorting out the many facets of strategic IT decision making, and recombining them into rational and practical "decision packets" with well-defined contents, boundaries and interfaces. The idea is not to force a decision into the mold of some Component, Part or Link of the Framework. It is rather to build the Components, Parts and Links of the decision packet itself, in such a way that the aggregate of all decision packets is still a meaningful and consistent super-system of Components, Parts and Links.

The Framework is primarily intended to be used in the "large" situation, the formulation and implementation of a company's overall IT strategy. The strategic thrusts and action plans described in Section 4.5 are, in fact, large-scale decision packets. The Framework could equally well be used in "small" situations, such as the selection a particular software package or the design of a particular departmental process.

III. DESIGN PRINCIPLES

The main sources on which the Framework relies are listed in Section 2.IV. Their influences on basic principles and concepts of the Framework are described in the present Section, while their influences on its structure will emerge in Sections 4.2 to 4.6. The format of this Section follows Ackoff's [1981: 63-76] "operating principles of interactive planning".

A. Interactive Planning and Idealized Design

Interactive planning is the fourth of the four basic orientations to planning described by Ackoff [1981: 52-64]:

> Reactivism: The planning aim is to restore a desirable previous state by reversing the effect of changes. Decision makers rely on experience and usually authoritarian organizational forms. They are generally hostile to change and to technology.

<u>Inactivism</u>: The aim is to preserve things as they are by preventing change. Corporate survival and stability are the key issues, and bureaucracy is the style. Problems are handled piecemeal as they arise.

<u>Preactivism</u>: The dominant management style in the United States. Planning, based on predicting the future, is aimed at accelerating change and exploiting the opportunities that it brings. Modern technology is welcomed, but is applied in terms of outmoded "machine age" concepts.

<u>Interactivism</u>: Interactive planning rests on the belief that the future depends as much on what is done between now and then, as on what has happened until now. The planning aim is "the design of a desirable future and the invention of ways to bring it about" [Ackoff, 1981: 62]. The impact of technology will depend on how it is applied, and how well it is applied will depend on humanistic as well as scientific considerations.

This is an interactive planning Framework, which describes how participative decision making and an entrepreneurial view of environmental data (Sections 4.2 and 4.3; see also Kanter [1983: 27-35]) can be combined in an organizational dialectic aimed at creating a desirable IT future for the company.

The Framework is constructed in terms of Ackoff's definition of three types of ends that decision makers can pursue - goals, objectives and ideals - which result in three levels of planning:

Ends	Planning Level	Timeframe
Ideals	Strategic	Long-term
Objectives	Tactical	Medium-term
Goals	Operational	Short-term

B. The Participative Principle

> "Most planners and consumers of plans believe that the principal benefit of planning comes from its product, a plan. The interactivist denies this. He asserts that in planning, process is the most important product. Therefore, the principal benefit of it derives from engaging in it." [Ackoff, 1981: 65]

According to Ackoff, it is through participation in interactive planning that members of an organization can best develop. They acquire that understanding of the organization that makes it possible to serve its ends more effectively, and this in turn facilitates organizational development.

But coping with the multiple levels of abstraction and domains of knowledge inherent in strategic IT decision making places severe demands on the competence and accountability of the decision makers. The principle of "adequacy" is therefore fundamental - the adequacy (level of understanding and competence) of the IT decision makers to the kinds and levels of decision they are accountable for, and the adequacy of the Framework to support them.

> "When the level of the knower is not adequate to the level (or grade of significance) of the object of knowledge, the result is not factual error, but something much more serious: an inadequate and impoverished view of reality." [Schumacher, 1977: 53]

More specifically,

> "The problem is that 'what management should be' is not independent, of 'what management can be' or 'what management wants to be.' Policy research should have taught that the selection of ends turns critically on which means a management is capable of pursuing. In turn, a

selection of means turns critically on the skills of the management coalition that shaped corporate goals." [Bower, 1982(1): 631]

This is a dialectical Framework, and the development of a company's strategic IT capability is deemed to consist of two inseparable parts - the development of the company's distinctive competence in deploying IT as a strategic resource, and the development of its managers as rational planners, implementors and users of information systems.

The dialectical method of strategic problem solving - "the habit of unfettered discussion" [Russell, 1961: 111] - is suitable where enough knowledge and information is already in existence to reach the right conclusions about, say, competitive strategy and organizational design, but where "conditions for error" (e.g. inaccessibility of individual views, vagueness and ambiguity, mistaken assumptions, lack of individual knowledge and insight, incompatible aims) [Argyris & Schön, 1978: 59] prevent the best logical use being made of what is known.

Hence questions such as "What is an effective IT application?", "What is competitive advantage?", "What business are we in?" are well suited to the dialectic method. Terms like these are used freely in discussion and in the literature, but managers need to examine the ways in which they are used in and around the organization, and agree on definitions that will best suit the organizational dialectic in their own company. Without such precision and consensus, any "shared vision" of the business future would be a myth.

C. <u>The Principle of Continuity</u>

The target environment is an ideal that may never be fully attained, at least not as it is envisaged at any given moment, and its architecture will be continuously reformulated as organizational learning takes place.

Commitment to implementation, and priorities, will be asked for only a piece at a time, as business and technological objectives are reevaluated in medium- and short-term planning. Always, however, decisions will be made in the language of the architecture. Sometimes the architecture will be maintained and the decision altered accordingly; sometimes it will be the other way around. Always, the potential long-term consequences will be analyzed. It must be acknowledged, however, that continuous planning and incremental progress towards a non-reachable target are not concepts that most managers will easily comprehend.

Traditionally, frameworks for organizational decision making, including the IT project management methodologies, have been built on the supposition that all decision making can be broken down into time-serial phases, with a beginning, a middle and an end. (See, for example, Huber [1980: 8] and Mintzberg [1979: 58] for the general business case, and Inmon [1983: 58] for the IT version.) This almost universally accepted view has its origins in more general techniques of "heuristic" problem solving, which set out stages such as "understanding the problem", "devising a plan", "carrying out the plan", "looking back" [Polya, 1957].

Witte [1972], however, found in a major investigation into over 200 cases of complex decision making processes, carried out over several years, that the "phase theorem" was not supported by the facts. His research revealed that:

"(1) A complex, innovative decision is a multi-operational, multi-temporal process;

(2) A complex decision-making process does not have only one final decision, but consists of a plurality of sub-decisions; the maximum number of these choices occurs at the end of the total process;

(3) The theorem's claim of information-gathering, alternative-developing, and alternative-evaluating

> operations can be found in decision-making processes in large numbers; however, they do not culminate in distinct phases in time, but rather are distributed over the total duration of the process." [Witte, 1972: 177]

Company-wide, strategic IT decision making is certainly complex, innovative, multi-operational and multi-temporal, and it cannot be broken down into one, or even a few, sequences of stages. Instead, in this Framework, it is represented as multiple ongoing cycles of organizational development and learning, in which both formulation and implementation of strategy are incremental and never concluded.

Witte's general conclusion captures the rationale of the Components, Parts and Links of the Framework:

> "We believe that human beings cannot gather information without in some way simultaneously developing alternatives. They cannot avoid evaluating these alternatives immediately, and in doing this they are forced to a decision. This is a package of operations, and the succession of these packages over time constitutes the total decision-making process." [Witte, 1972: 180]

D. <u>The Holistic Principles</u>

Ackoff [1981: 6-24] sees the present era of environmental turbulence as a period of transition in which a "Systems Age" is emerging "dialectically" from a "Machine Age".

In the Machine Age, problem solving proceeds from analysis to synthesis - divide the thing to be understood into its constituent parts, try to understand each part, and then try to assemble this understanding into an understanding of the whole.

The underlying philosophies are reductionism (the belief that complex ideas can be completely understood in terms of their simpler parts or components), determinism (the belief that all events stand in a cause-effect relationship with other events), and mechanism (the belief that all phenomena, including organizations, can be explained in mechanical terms).

In the Systems Age now emerging, problem solving proceeds from synthesis to analysis - identify a containing whole (system) of which the thing to be understood is a part, explain the behaviour or properties of the containing whole, and then try to explain the thing to be explained in terms of its purposes and uses in the containing whole.

Here the underlying philosophies are expansionism (the belief that understanding is increased by expanding the systems to be understood, not by reducing them to their elements), a producer-product view of the world (which replaces the search for the sufficient conditions of a cause-effect relationship, with a search for necessary conditions in the environment of the product to be explained) and teleology (which makes it possible to look at systems in an output-orientated way - choice, purpose, goals, objectives, ideals - rather in the input-orientated way of determinism).

As explained in Section 4.1.II.C., the Components, Parts and Links are not intended as a means of analyzing some problem - a given strategy, an organizational design, or an information system - into a set of isolated constituents. Their purpose is rather to help in synthesizing a useful picture of the "whole" that contains the strategies, structures and systems of the company.

For this reason, the conventional universe of discourse in systems planning is expanded to include such matters as organizational design and development, management development, management accounting, and organizational learning. The purposes and uses of IT are investigated, not bottom-up from the characteristics and functionality of the constituent technologies, but top down from the environment in which the company and its systems operate.

Four holistic principles are built into the Framework. Three of these derive from Ackoff [1981: 71-74], and the fourth from Benjamin [Seminar E-01].

1. Integration and Differentiation

With regard to Process, the Framework aims at integrating all facets of strategic IT decision making through the notions of Components, Parts and Links, while at the same time differentiating the IT decision making roles according to the various management domains in the company. It does this in a way that can accommodate quite different business strategies and business systems developed by different business units of the same company. The overall scheme is closely related to Tapscott, Henderson & Greenberg's [1985: 7] "Components of an Integrated Systems Plan", and to Nolan, Norton & Company's "Computer Architecture Blueprints" [Advanced Systems Inc., Course 5055].

The principles of integration and differentiation are also relevant in the Content and Structure of strategic IT decisions. On the business side, the seminal work is Lawrence & Lorsch's [1967] "organization and environment" approach to analyzing organization structure and functioning. A useful overview and a synopsis are readily available in Pugh [1984: 87-105] and Pugh, Hickson & Hinings [1983: 44-49].

> "It is in order to cope effectively with their external environments that organizations must come to develop segmented units, each of which has as its major task the problem of dealing with some aspect of the conditions outside the firm. This <u>differentiation</u> of function and task is accompanied by differences in cognitive and emotional orientation among the managers in different

units, and differences, too, in the formal structure of different departments." [Pugh <u>et</u> <u>al</u>., 1983: 44]

"In spite of this, the organization is a system which has to be co-ordinated so that a state of collaboration exists in order to obtain for members the benefits of effective transactions with the environment. This is the required <u>integration</u> and it, too, is affected by the nature of external conditions." [Pugh <u>et</u> <u>al</u>., 1983: 45]

Thus the Framework insists, firstly, on the recognition of different IT decision making domains, consisting of people with disparate cognitive, emotional and other orientations (Section 4.2.II.). Secondly, it defines a "strategic business system" as a recombination of organizational processes and information systems, aimed at extending the cognitive, emotional and other bounds of rationality of the individuals and workgroups whose various purposes it serves (Section 4.3.III.B.). Finally, it provides, through the "quadrants of IT strategy" (Figure 9 and Section 4.3.I.), a way of integrating different views of the Content of an IT decision. With regard to Structure, the major integrative devices are the Target Environment Architecture, and the definition of both a "strategic business system" and an "applications portfolio" in terms of Porter's [1985] "value chain" concept (Section 4.4.).

2. Co-ordination

The Framework co-ordinates strategic IT decision making across the business units of the organization in two ways. Firstly, it indicates which aspects of IT strategy are suitable for autonomous decision making by the business units and which are more appropriately the subjects of central or joint responsibility and action. Secondly, it suggests staff functions, decision making processes and co-ordinating committees that are needed to unify IT strategy on a company-wide basis.

From Lawrence & Lorsch's "organization and environment" point of view, these are further examples of "integrative devices", and how elaborate and extensive a particular company requires them to be will depend on the degree of differentiation in the company [cf. Pugh <u>et</u> <u>al</u>., 1983: 46].

3. Contingency

McFarlan, McKenney & Pyburn [1983: 149-156] show that the importance of IT varies widely between different companies. The kind of IT support required, the financial and human resource it is worthwhile to commit to it and the effort that will be spent on IT decision making depend on circumstances. Even within a given company, a decision may be strategic from one point of view but not from another, or strategic at a certain time but not at another.

> "It should be noted that no type of decision is inherently strategic; decisions are strategic only in context." [Mintzberg, 1979: 60]

For example, a decision to apply IT to save company operating costs, i.e. to improve the efficient use of resources already allocated, would not ordinarily be regarded as strategic. But it would be so if company survival depended on conservation or reallocation of resources.

Similarly, a decision to acquire a database system based on purely technical grounds, e.g. more efficient retrieval of data, may be regarded by technical managers as a strategic matter, e.g. machine capacity and service reliability, but not by business managers, who may only become aware of the issue if the cost is high. If, however, the decision is aimed at enhancing a product or service of the company in a way that distinguishes it from the competition, it would be strategic to business management, but possibly not to technical managers, who may not even be aware of the purposes the system serves.

4. Directed Incrementalism

This is a general purpose Framework, which is meant to support strategic IT decision making in many different situations, across all three planning levels and timeframes, and through many stages of implementation over time. It is, in a sense, a "total systems approach" [Blumenthal, 1967: 23], which must be described and understood in its entirety before decision makers can be asked to accept it. Nevertheless, it is neither possible nor desirable that all of it should be specified in detail before any kind of implementation begins.

Similarly, the Target Environment Architecture and the Master Transition Plan must be described and understood, at least in overall terms, before managers can be asked to commit to them as the IT strategy of the company. Here too, however, complete details cannot, and should not, be specified in advance.

To overcome these problems, four broad "levels of discourse" are identified, as illustrated in the Boxes of Figure 3 [cf. Hunter, 1971: 3]:

> <u>The Conceptual Level</u>: This is the level at which generic strategies and broad architectural options are discussed.
>
> e.g. "There are two aspects to the role IT can play in a company's business strategy: firstly, the purposes it will serve in the competitive strategy; secondly, its uses in organizational design. Various kinds of purpose and use can be identified, and some uses will be better suited to some purposes than to others."
>
> "In interactive planning, based on the principles of idealized design, an IT technology strategy can be expressed in terms of a Target Environment Architecture."

This is the level at which the Framework can be described in overall terms, as in this Study. It is represented by the upper Box of Figure 3, and provides a common language in which the issues of strategic IT decisions can be discussed by managers from different backgrounds.

> "The key is the understanding that before you can have a strategy you must have a target that has achieved corporate consensus, and before you can have such a target, you must have a framework - a clear vocabulary that provides a basis for communication, classification, and planning." [Benjamin, Seminar E-01, Section 2, Page 1]

<u>The</u> <u>Meta</u>-<u>Architectural</u> <u>Level</u>: The Framework must be customized to meet the particular technical, organizational and cultural requirements of the company concerned. Its Components, Parts and Links are selected and adapted as necessary. In particular, the Structure Component becomes the meta-architecture of the Company's own target environment.

The meta-architectural level is concerned with long-term ideals, and its terms of reference are much the same as those of the conceptual level. An effort should be made to reformulate the selected elements in company-specific terms. It has been found in practice that strategies and architectures offered in the "vanilla" terms of a conceptual framework tend to be rejected as "motherhoods" and "theories" by those who are asked to implement them.

<u>The</u> <u>Macro</u>-<u>Architectural</u> <u>Level</u>: This is the level at which different classes of IT strategy and architectural approaches are discussed.

e.g. "We can use inter-organizational systems in a strategy of product/service differentiation aimed at our customers, in order to increase the cost to them of switching their business from us."

Incrementally over time, parts of the meta-architecture of the target environment will be instantiated as a growing macro-architecture, with sufficient detail being brought in at each stage to lay down attainable objectives for the current medium-term tactical plans.

The Micro-Architectural Level: This is the level at which specific statements of IT strategies and architectures are made.

e.g. "We will install computer terminals on our customers' premises, at our own cost, giving them direct access to our product catalogues and order-entry system and thereby encouraging them to place x% or more of their business with us."

"We will give the design departments of our customers direct access to our inventory system, via their own CAD/CAM equipment, to ensure that at least x% by value of their product content is sourced from us."

The micro-architecture of the target environment will specify complete details and goals for realization in short-term action plans.

It may now be seen how the organizational IT learning loops, are the converse of incremental IT strategy implementation. In Figure 3, the arcs to the left of the Boxes represent the three levels of IT strategy implementation - customization, instantiation and realization. The arcs to the right represent the levels or loops of organizational IT learning.

Whenever strategic IT decisions are made, they are evaluated against the next higher level shown in the Figure, so that errors can be identified and eliminated. If, in some action plan, an apparent error in the micro-architecture (Section 4.4.I.) can be corrected either in the micro-architecture itself or in the macro-architecture (Section 4.4.I.), the organization can continue with its business vision for IT as currently understood, and single-loop learning is said to have occurred. If, however, the error can only be corrected by re-instantiation of the macro-architecture (e.g. because some assumption was mistaken, or because the role of IT in the business strategy has changed in some way), double-loop learning is said to have occurred. If correcting the error requires re-customization of the meta-architecture (e.g. because decision makers' ideas about creativity and the management of innovation have changed, or indeed simply because the decision making framework is to be changed), then second-order learning is said to have occurred.

In this way, the learning loops provide the essential adaptive mechanisms that make incremental implementation of a Target Environment Architecture feasible, and justify "directed incrementalism" as an acceptable principle in strategic IT decision making. In practice, the loops will be imbedded in formal learning systems (Section 4.6.IV.) and in implementation control processes (Section 4.5.III.).

The levels of implementation, architecture and learning are also useful in analyzing Types I and II relationships. For example, a systems designer may strongly believe that a set of online dialogue screens should be structured in a certain way (Structure Component - Information Systems). The intended user may disagree, believing that it will not match the way the department's work is organized (Structure Component - Human Systems), and conventional wisdom will dictate that the user's view must prevail. Both the designer and the user are, however, creatures of their circumstances and neither has an automatic claim to being right about what the future will require. Tracking each party's argument up the levels of discourse, ultimately to the concepts of "strategic business system" and "purpose" (Section 4.3), will determine which view is the correct one, if either is.

IV. TOOLS AND TECHNIQUES

A great many tools and techniques for specific purposes in strategic IT decision making have been proposed. It is an aim of this Framework to show how they can be brought together as a practical tool-kit, and to encourage IT decision makers into new ways of thinking with the help of these tools.

It is beyond the scope of this Study to offer anything like a complete listing of them, nor is it possible to prescribe some subset as being applicable to all or even most companies. The tools and techniques mentioned in Chapter 4, in Appendixes C, D and E, and in Questions 108 to 142 of the Survey Questionnaire (Appendix B) have been selected for their special relevance to the line of thinking developed in this Framework.

oooOooo

4.2 DECISION MAKING CONTEXT

I. THE IT PLANNING ENVIRONMENT

Uncovering the key issues in a company's strategic IT planning environment requires much more than simply postulating an age of "chaos", "turbulence" or "transition" through which IT is to help the company pass, profitably and securely, to a more stable and better understood future - an "information society" [Naisbitt, 1984: Ch. 1], or a "systems age" [Ackoff, 1981: 13], or an age of "electronic cottages" in a "global economy" [Toffler, 1981: 204, 335].

Change, turbulence and the global spread of a company's operating environment have been facts of business life since the breakdown of the feudal system. Indeed, business cannot survive

> "without constantly revolutionizing the instruments of production, and thereby the relations of production, and with them the whole relations of society. ... Constant revolutionizing of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation, distinguish the bourgeois epoch from all earlier ones. ... The need of a constantly expanding market for its products chases the bourgeoisie over the whole surface of the globe." [Marx & Engels, 1848: 207]

Strategic IT decision makers must probe beneath appearances to uncover the underlying forces shaping the company's environment. They must also examine their own underlying beliefs and assumptions, which determine their view of the world, before they can come up with a reasonably objective list of "critical success factors" [Boynton & Zmud, 1984; Bullen & Rockart, 1981; Rockart, 1979], or a "SWOT" list (Strengths, Weaknesses, Opportunities and Threats), that is significant enough to hold the keys to successful competitive performance through the use of IT.

" ... the real validity of a plan depends as much on the relevancy of the particular assumptions that management brings to bear on the problem as it does on the accuracy of the logical process employed. Consequently, the important research questions become: 'How might we expose management's underlying assumptions?' and 'How might we stimulate management to adopt a broader and more considered view of the planning problem?" [Mason, 1969: B-404]

Recent research reported by Ireland, Hitt, Bettis & De Porras [1987] confirms Lawrence and Lorsch's [1967] basic thesis, that different tasks at different levels of the same organization cause managers to focus on different indicators of strengths and weaknesses. Their planning assumptions differ, and they view the operating environment differently. The aim of the decision making process must, therefore, be to help them understand how their assumptions affect the way they interpret the environmental data, and how the fact their interpretations differ from those of other decision makers confronted by the same data results in a variety of world views within the same management team.

It is this variety of world views [Mason & Mitroff, 1981: 172, 188], and the interactions among them, that constitute the Context of strategic IT decision making.

Mackenzie's [1986] concept of "organizational congruency" provides a theme around which to organize the study of these inter-relationships, and an appropriate frame of reference for the dialectical enquiry described in Section 4.2.III.

"There are two main types of congruency. The first is called structural/functional/environmental (SFE) congruency. SFE congruency describes the fit among the environments, the mission, goals, strategies, and tactics of the organization, the Organizational Technology and results. ... The second type of congruency is called bonding congruency. Bonding congruency describes the fit between the organization and its associates." [Mackenzie, 1986: 73]

The application of this concept in the present Framework is illustrated in Figure 4:

First Row: The environmental data and the current IT strategy, as reflected in existing operational systems and development projects, can be analyzed in a dialectical enquiry or "structured debate" [Mason, 1969: B-408] to expose the beliefs and assumptions that must have influenced the way managers interpreted the data in arriving at this strategy. The aim is to produce a new synthesis of data, interpretations, assumptions and strategies, which can be organized into a system of opportunities and threats, strengths and weaknesses, and critical success factors, on which to build a business strategy that exploits IT.

Second Row: Competitive strategy and organizational design are complementary activities, in the same way that entrepreneurial effectiveness and administrative efficiency are complementary management attributes [Drucker, 1979: 43-45]. Congruency between strategy and structure is not, however, an automatic consequence of strategic decisions - it has to be planned, organized, implemented, controlled, differently according to circumstances:

> "Each generic strategy implies different skills and requirements for success, which commonly translate into differences in organizational structure and culture. Cost leadership usually implies tight control systems, overhead minimization, pursuit of scale economies, and dedication to the learning curve; these could be counterproductive for a firm attempting to differentiate itself through a constant stream of creative new products." [Porter, 1985: 23]

> "The failure to develop a new internal structure, like the failure to respond to new external opportunities and needs, [is] a consequence of over-concentration on operational activities by the executives responsible for the destiny of their enterprises, or [of] their inability, because of past training and education and present position, to develop an entrepreneurial outlook." [Chandler, 1962: 15-16]

The driving force for congruency between strategy and structure in IT decision making can come from either of two directions - from an innovative use of IT in competitive strategy that demands corresponding changes in organizational structures and processes, or from an innovative use of IT in organizational design - jobs, workgroups, business units and the inter-relationships among them - that creates new opportunities for competitive strategy.

In this Framework, therefore, it is suggested that an innovative use of IT can be analyzed in two complementary ways - as an impact on the company's competitive strategy and organizational design, and as a widening of the "limits of rationality" [Bakopoulos & Treacy: 1985, 5-7] that will permit managers consciously to research, design and initiate such impacts .

This leads to a second kind of congruency in IT strategy - that between the competence of the company as a competing organization in its industry and market places and the competence of its IT decision makers, individually and collectively.

<u>Third</u> <u>Row</u>: The "distinctive competence" of a company [Hofer & Schendel, 1978: 25-26] has two parts: a competitive part, i.e. the company's potential for superior performance in

bringing its resources to bear in its market activities; and an organizational part, i.e. its potential for superior performance in utilizing its resources in the creation of its product. These potentials can only be realized to the extent that strategic IT decision making is in the hands of a management team who are, collectively, competent entrepreneurs, administrators and IT planners.

> "Ten years ago, nobody was very interested in doing information technology strategies. Today, the vast majority of large companies have tried to do it - and failed. This is not because it can't be done - it's because the wrong people are doing it, the wrong way, in the wrong timeframe, and with the wrong objectives." [Benjamin, Seminar E-01: Section 2-2]

It is through carefully planned processes of organizational development, and the body of behavioural science knowledge and techniques available to support them, that the required congruency between company development and decision maker development can be achieved. This would, in turn, require a realization by the management team that competitive strategy and organizational design call for different decision making skills, and hence a rearrangement of their strategic problem solving processes around this reality.

In short, the conditions for both company and decision maker development have to be created.

> "An integral part of the change project could be an examination and change in the organization's problem handling or management. Through a relatively small additional investment in time and effort, the change effort could do double duty - resolving the "problem" at hand <u>and</u> providing an opportunity to develop, practice, and evaluate improved organizational problem-handling styles." [Beckhard & Harris, 1977: 89]

Fourth Row: Achieving and sustaining the above two kinds of congruency requires that a company possess some means of ensuring it adapts strategy and structure as the operating environment changes, and that its managers learn, individually and collectively, to become increasingly effective in making IT decisions.

The problem can be seen as that of ensuring that individual learning does indeed become organizational. In this Framework, it is suggested that this can be achieved by developing an explicit set of "shared images and maps", embodying a common management vision for the future of the company, the role of IT in creating that future, and the way in which the company should progress towards that vision over time.

The role of IT can be analyzed in terms of the purposes it serves in competitive strategy and the uses to which it is put in organizational design. If a third kind of requisite congruency is accepted - that between the purposes and uses of IT - then managing IT strategy can be seen as a matter of learning to manage purposes and uses. Creating new insights into the purposes of IT in competitive strategy will be the focus of entrepreneurial competence, and translating these into appropriate uses of IT in organizational design will be the focus of administrative competence.

Figure 4 is in essence a new look at the traditional formulation and implementation steps of strategic problem solving [cf. Bower, 1982(2)]. Horizontally, the rows depict the three major congruencies (objectives) that have to be created and managed between the categories represented by the boxes; vertically, the columns depict the matches or fits (constraints) that have to be achieved between these categories. The aim is to provide a platform for a radically "new management point of view" [McFarlan, 1984: 102-103] in strategic IT planning, based on the understanding that interactive planning in general, and strategic IT decision making in particular, is a complex task full of contradictions and pitfalls.

> "... strategy formulation is a negative activity in the sense that it requires a testing of the premises on which the organization is operating. This challenge is a socially disruptive force. Social organization resists change, and its study and introduction can interfere with the executive's role as leader. ... the activities that constitute exploiting the strength of the organization and those that represent a testing of strength against the opportunities and risks posed by a changing environment are hard to distinguish.
>
> "If one seeks to be too systematic, it is easy to focus on a tiny piece of activity that is obviously strategic and lose the importance of the whole pattern, the seminal elements of which are seldom systematic." [Bower, 1982(1): 630]

The relationships between dialectic and development portrayed in Figure 4 are not historical or inevitable processes in a Hegelian or Marxian sense. They depend entirely on the quality of management thinking, vision and effort, and on the reliability of the analysis of external and internal environmental data. There are, unfortunately, many reasons why the relationships can fail in practice.

> "When someone is asked how he would behave under certain circumstances, the answer he usually gives is his espoused theory of action for that situation. This is the theory of action to which he gives allegiance and which, upon request, he communicates to others. However, the theory that actually governs his actions is his theory-in-use, which may or may not be compatible with his espoused theory; furthermore, the individual may or may not be

> aware of the incompatibility of the two theories." [Argyris & Schön, 1978: 11]

Moreover, people do not always speak the truth as they know it when communicating their espoused theories:

> "First, the researcher can be misled because people want it that way. People lie, evade, and otherwise deceive the field-worker in numerous and inventive ways. ... The second way a researcher can be misled in ethnography is when one's informants are themselves misled and wrong about matters of their concern. ... The third way an ethnographer can be misled is because informants are sometimes totally unaware of certain aspects underlying many of their own activities. Like fish who are presumably unaware of the water in which they swim ..." [Van Maanen, 1979: 544-546]

A third difficulty is the unsuitability of generally available IT problem solving techniques to the "ill-structured" problems of IT strategy. Ill-structured problems have one or more of the following characteristics [Mitroff & Emshoff, 1979: 1; cf. Ackoff, 1981: 52]:

> The problem can be clearly stated, but decision makers cannot agree on an appropriate solution or strategy.
>
> They cannot agree on a methodology for developing such a strategy.
>
> They cannot agree on a clear formulation of the problem (objectives, controllable variables, uncontrollable variables).

In particular, strategic IT decision making is an organizational ill-structured problem, in that it requires the commitment of many people to strategy formulation, implementation and control.

Four criteria for a good approach to analyzing the IT planning environment can be inferred from the above discussion [Mason, 1969: B-406; Wood, 1981: 195]:

> It should expose the assumptions underlying a proposed plan so that management can reconsider them.
>
> It should suggest new and more relevant assumptions upon which the data may be re-interpreted and the planning process can proceed.
>
> It should expose fictitious espoused theories, and either eliminate them from the debate or accept them as realities of the organizational situation - what Van Maanen [1979] calls "the facts of fiction".
>
> The data analysis should not rely solely on formal true/false logic, but also on a model of change, conflict and development in an organization that "is simultaneously trying to realize an ideal for itself and to discover what ideal it wants to realize"

The Hegelian dialectic provides precisely such a model. It is, however, crucially important to have a very competent facilitator to conduct the process, since

> "everything depends on the details of its execution, on whether the 'life of the content' really displays dialectical inter-connections and tendencies, and on how well the practitioner of the dialectical method is able to establish each specific connection and transition by good arguments." [Wood, 1981: 199]

The Marxian prescription for the resolution of conflicts and the transformation of organization structures, i.e. revolution, is not of course advocated in this Framework. Here, the analogues of class and revolution are the decision making domains described in the following Section and the transition stages described in Section 4.5.II. Implementing the Framework in practice, as described in Chapter 5, can be structured in terms of the four categories of "dialectical activity" shown in Figure 4.

II. DECISION MAKING DOMAINS

A simple test (the Vroom-Yetton model) shows that under the conditions described in the preceding Section, the most effective decision making style is as follows:

> "You share a problem with your subordinates as a group. Together you generate and evaluate alternatives and attempt to reach agreement (consensus) on a solution. Your role is much like that of chairman. You do not try to influence the group to adopt 'your' solution and you are willing to accept and implement any solution that has the support of the entire group." [Vroom, 1974: 67]

The essential point is that strategic IT decision makers from different backgrounds bring different contributions to the process, and through dialectical enquiry generate new insights that culminate in a shared vision of an ideal company-wide IT environment. The architectural blueprints and action plans *per se* are of secondary importance.

Strategic IT opportunities, i.e. good matches between purpose and use, can be sought and found in any part of the organization. For example, the American Hospital Supply Corporation order-entry system [EDP Analyzer, January, 1984: 4] was originally conceived as an operational and management control response to business strategy. Its effect on the company's market share apparently came as a surprise to management. In general,

> "... research indicates that strategically oriented information technology applications can be generated at all organizational levels. In fact, most of the effective

applications we have seen have been developed spontaneously at lower levels within the organization." [Benjamin, Rockart, Scott Morton & Wyman, 1984: 5]

Since almost anyone with some insight into the business can participate in dialectical enquiry, some selection principles are evidently called for. Figure 5 shows four decision making "domains" in an organization, from each of which participants can be drawn for the different contributions they can make.

A. Business and IT

The two vertical columns of Figure 5 are based on Benson & Parker's [1985: 8] concept of a "business" and a "technology" domain.

In the business domain, strategic issues tend to reflect management's responsibility for clarifying the direction and goals of the business, in a turbulent social, economic and political environment. In the IT domain, they reflect the responsibility to understand the business strategy and to be ready with timeous, stable support, in a rapidly changing technological environment.

The environmental variables scanned in the two domains relate to different kinds of issue, have different rates of change, and are measured in different ways. For example, market opportunities have to be grasped within very short time frames, often a matter of months. Projected costs and revenue can be precisely calculated and discounted, to arrive at an investment decision. IT applications, on the other hand, tend to have long development lead times, cost impacts that will be felt many years after implementation, and, except in the simplest cost-displacement types of application, benefits that are quite difficult to quantify and project.

Clearly, problems expressed in the language of one domain are unlikely to be understood by people in the other domain. A significant IT decision could be made by default, or by the wrong person, with no perception at the time that a strategic decision is in fact being made - as when the selection of crucial database management software is left to relatively junior technical people, or when business management enforces unrealistic development deadlines to the detriment of system quality.

Problems of this kind can usually be diagnosed by comparing a company's stated business plans with its actual IT expenditures. Not enough resource may be invested in IT overall, or in applications identifiable as strategic, or in relation to what the competition is investing. Conversely, a company may be spending heavily on IT to differentiate itself and its products in the eyes of buyers, while at the same time trying to compete on price. Or it may be providing extensive end-user programming facilities, with no means of measuring the increase in organizational effectiveness this is intended to produce.

The communication gap between the business and IT domains is in part a matter of functional area orientation and responsibility, but it arises out of quite fundamental differences of personal background, training and point of view. Nolan [1982: Ch. 22] suggested that business needs a "new breed" of DP manager with sufficient grasp of both the business and IT domains to resolve these differences. It seems unlikely, however, that such people can be developed in sufficient numbers, in South Africa at any rate, to make this a credible generic human resource strategy for IT.

Instead, the acceptance of separate business and IT domains as a fact of life can provide a basis for effective, company-wide IT decision making. Conflict and contradiction - in ends, ways, means and priorities - are accepted as organizational realities, and indeed welcomed as the stuff of dialectical enquiry and a source of innovative solutions.

The kind of conflict that arises out of role confusion is another matter. What contributions to IT decisions have to be made by whom, when, and on the basis of what knowledge, is a crucial issue that has to be cleared up before productive dialectic can take place. The problem is particularly important in companies where decentralization of IT responsibilities has led to the emergence of "business systems departments", "user programmers" and a variety of new jobs whose incumbents see themselves as IT experts of one kind or another.

B. Inside and Outside the System

The "competitive weapon" stories of the IT literature invariably show that the purposes of strategic applications go far beyond conventional notions of "user needs". For example, a company may install an inter-organizational order-taking system to cause its clients to place more orders with it, or to make it difficult for the client to switch to another supplier. The information supplied to the client is the means, not the end, of the system.

Similarly,

> "In testimony before the Civil Aeronautics Board (CAB), Frontier Airlines alleged that United Airlines, developer-owner of APOLLO, a widely used reservation system, was enjoying unfair competitive advantage by monitoring loading factors of competitors and then using the system to either lower prices or broadcast special messages to travel agents." [Cash & Konsynski, 1985: 135; Harvard Business School, 1983]

The purpose of such applications is primarily to modify the behaviour of users and operators, who work within the context of the system, in the manner needed to serve the aims of the owners and developers, who work outside the system.

C. The Four Domains

The above pairs of categories, taken together, lead to the four domains shown in Figure 5:

> Owners: Decision makers who determine company strategy. They have the authority to commission projects for the development of IT infrastructure and business systems (i.e. organizational processes together with the information systems that support them), to allocate the financial, human and other resources the projects require, and to set priorities.
>
> Developers: Decision makers who develop and implement IT architecture. They have the responsibility for designing and building IT infrastructure and business systems, planning the utilization of resources allocated for this purpose, and managing implementation. It should be noted that organization and methods (O&M) specialists are specifically included in this domain, since this Framework does not permit the separation of organizational process design from information system design.
>
> Users: Decision makers who determine how the infrastructure and application systems will be used, and in fact use them. They have the responsibility for ensuring that the proper match between organizational process and information system is maintained, and that both remain congruent with the strategic purposes for which they were designed.
>
> Operators: Decision makers who manage the infrastructure and run the application systems. These are the data processing managers, computer operators, network controllers and so forth who deliver the ongoing development and production services of the infrastructure. They acquire resources in accordance with policies and budgets, and administer their utilization.

An architecture for generic IT decision making roles, tasks and responsibilities, based on these four domains, is described in Section 4.4.V. It will be seen there that, as far as individual tasks are concerned, the domains are not mutually exclusive. For example, an applications programmer would be a developer relative to the information systems dimension of the target environment, but a user relative to the infrastructure dimension. The important point is that the four domains represent different roles, responsibilities and interactions with the environment, and hence different world views and goal systems [Lawrence & Lorsch, 1967: Ch. 2].

The criteria suggested for choosing participants in the dialectical enquiry of this Component are adapted from similar criteria for selecting participants in information systems design [Anderson, E.E., 1985]:

> <u>Business Domain</u>: Persons with sufficient knowledge and experience of IT and its applications to be able to contribute meaningfully to the enquiry.
>
> > <u>Owners</u>: Senior managers who are willing to become involved in IT decision making, and to make available the time and other resources needed for productive, participative decision making.
> >
> > > "In order for IS to become a viable competitive weapon, senior management must understand how IS may impact the competitive environment and strategy of the business. Such an understanding will enable managers to direct IS resources to the firm's most important targets." [Parsons, 1983: 4]
> >
> > <u>Users</u>: Persons who can perceive and evaluate the job, inter-personal and organizational changes that are likely to flow from the decisions.

<u>IT Domain</u>: Persons with insight into business issues generally and the company's business in particular.

> <u>Developers</u>: Persons who can put sufficient structure into problems to allow enquiry to begin, overcoming or absorbing special departmental arrangements.
>
> <u>Operators</u>: Persons with a willingness to allow non-technical people a substantial influence in determining technical directions.

Guidelines for forming and conducting working groups in dialectical enquiry can be taken from the Nominal Group Techniques [Delbecq, Van de Ven & Gustafson, 1975] and from Mason & Mitroff's [1981: 112-122] "dialectical debate".

III. <u>DIALECTICAL ENQUIRY</u>

Russell [1961: 109-111] defines "dialectic" as a method of seeking knowledge by question and answer.

> "Logical errors are, I think, of greater practical importance than many people believe; they enable their perpetrators to hold the comfortable opinion on every subject in turn. Any logically coherent body of doctrine is sure to be in part painful and contrary to current prejudices." [Russell, 1961: 110-111]

The two particular dialectical techniques proposed for the analysis of the environmental factors are:

> Mason's "dialectical debate" [Mason, 1969; Mason & Mitroff, 1981; Mitroff & Emshoff, 1979]. This technique derives from the "thesis, antithesis, synthesis" paradigm commonly associated with Hegel, through which "successively richer definitions [are generated] by exhibiting each of them as solving the particular difficulties inherent in the one

which precedes it." [Wood, 1981: 198]

Hayes' [1985] "means-ways-ends" inversion of the conventional "ends-ways-means" paradigm of strategic planning.

The former is the logic proposed for exposing and analyzing the underlying assumptions of strategic IT decision makers. The latter is the logic proposed for the complementary analysis of environmental data, as described in Section 4.2.IV.

A. <u>The Aims of the Method</u>

The Mason & Mitroff method addresses three major weaknesses commonly encountered in strategic IT decision making:

Failure to consider in a systematic and explicit way strongly differing alternatives for IT policies and projects.

Organizational self-sealing, which makes it difficult to challenge preferred policies and traditional ways of selecting and implementing IT.

Superficial criticisms directed at the surface characteristics of an IT proposal (e.g. whether it is consistent, complete and well-documented - although these are obviously important issues), but not at challenging the underlying assumptions (e.g. why this proposal and not another - indeed why an IT solution at all?). [cf. Mitroff & Emshoff, 1979].

The same difficulties that arise in IT strategy research (Section 3.II.A.) make it impractical for managers to test proposed policies and projects empirically. The best course that is normally available is systematically to develop and challenge radically different alternatives. The strongest challenges would be expected to come from counter-proposals that penetrate deepest to the underlying assumptions.

Conflict and contradiction are needed to generate maximally opposing proposals, and to ferret out and challenge the underlying assumptions of each proponent. Commitment is needed if the participants are to make the strongest possible case for their respective points of view. Flexibility and vision are needed to perceive and accept solutions that synthesize apparently contradictory proposals.

Strongly opposing standpoints can, however, result in such a polarization of opinions that neither synthesis nor compromise is possible. If this happens, participative decision making fails, and leadership must revert to one of the other styles in the Vroom-Yetton model [Vroom, 1974: 67].

In summary, the objectives of dialectical enquiry may be stated as follows:

> To help surface for explicit examination the assumptions that underlie proposed IT policies and projects.
>
> To compare and evaluate these assumptions.
>
> To examine how the proposals are related to the assumptions, and the assumptions to the available data.
>
> To formulate new, originally unforeseen strategies, based on originally unseen assumptions, and, possibly, on a better understanding of the data.

B. Generating Alternatives

Typically, the process begins where some, probably not many, of a company's managers have a vague idea that the company needs an IT strategy. Often, several IT policies and strategic applications will already have been implemented, ad-hoc and piecemeal.

The four steps of the method are shown in Figure 6.

Step 1 - Surfacing Current Assumptions: This Step works backwards from strategies to assumptions.

What are the original strategies? Assess the significant elements of existing IT strategy, as revealed in existing infrastructure, policies, application systems, organizational processes and job designs, human resource plans, and IT management processes.

What are the relevant data for these strategies? Identify and evaluate the critical environmental factors (Section 4.2.IV.).

What are the underlying assumptions? Identify the assumptions decision makers must have held which, considered together with the data, allow the existing strategy to be deduced as a consequence. The identification of differences, contradictions and conflicts is the crucial element - e.g. differences between organizational and personal goals, between theories-in-use and espoused theories, and between the business domain and the IT domain.

The success of this step will depend critically on the skill of the facilitator in drawing out assumptions and revealing contradictions.

Step 2 - Dialectic: In this Step, each of the assumptions previously identified is reformulated as a counter assumption that negates the spirit of the original statement. The point here is that plausible counter assumptions can be used, deductively, to identify entirely new business and IT strategies, in the presence of exactly the same environmental data. It is clear from Mason's [1969: B-410] examples that negating the spirit of an assumption is much more subtle than simply inserting "not" into the original statement.

Step 3 - Integrating Assumptions: This is the logical continuation of the Dialectic Step, the synthesis that follows negation. At the start of the Step, a large pool of original and new strategies will have been obtained. By a process similar to that of Step 1, the subset of original and negated assumptions is identified which, when coupled with the data, allows the strategies in the pool to be deduced as consequences.

Thus, instead of trying to resolve contradictions between the alternatives directly at the resultant level of strategy, the process concentrates on negotiating a pool of assumptions that the decision makers are willing to accept as given conditions for the formulation of new but apparently acceptable IT strategies.

It was found in the relevant research that by dealing on the level of assumptions decision makers were able to reach agreements that would not otherwise have been obtainable. There can be no guarantee, however, that a significant pool of acceptable assumptions will always emerge. If it does not, then synthesis is not possible by any means, short of imposing one person's view on all others.

Step 4 - The Business Vision for IT: The final Step is the creation of a composite set of alternative strategies and the identification of a "best strategy". The output of this Step is a new view of the company's IT strategy alternatives, expressed in broad, intuitive terms. Since it is thoroughly grounded in an agreed set of acceptable assumptions and a closely corresponding analysis of the critical environmental data, it constitutes appropriate input to the Content Component of the Framework.

In the Content Component, conventional, deductive management techniques can be used to develop an exact, operational formulation of the "the business vision" of the purposes and uses of IT in the company. This formulation will, in turn, be used as input to the Structure Component, where IT tools and techniques will be used to develop the architectural blueprints of the target environment.

Mason & Mitroff [1981] provide detailed guidelines for carrying out a dialectical enquiry exercise. Whether and how the groups participating in the exercise will continue to be involved in the other Components of the Framework is a matter of company choice, and the way it manages the broader issues of organizational dialectic, development and learning. General guidelines are discussed in Section 4.4.V. (Human Resource Architecture) and Section 4.5.III. (Management Structures and Processes for Transition).

IV. ENVIRONMENTAL DATA

Scanning the business environment and analyzing environmental variables is a major task in any organization with a commitment to planning. Two additional tasks are called for in this Framework: a sharpening of focus on the specifically IT-related issues and their potential impacts on the business, and a shift in emphasis from predicting the likely future to shaping a desirable one.

The details of scanning and analysis can be carried out by corporate planning staff, supplemented as required by the IT support organization described in Section 4.4.V.C.2. The results of the analysis, however, enter the dialectic enquiry as the "Data" in each of the four Steps of Figure 6, and as background in the resulting Corporate IT Scenario(s) (Section 4.2.IV.C.)..

The method described below is based on:

Hayes' [1985] "means-ways-ends" paradigm for strategic planning.

Bates' [1985] "MAP" for monitoring, analyzing and predicting environmental variables.

Etzioni's [1985] synthesis of the incrementalist and rationalist-comprehensive approaches to strategic planning into a third approach he calls "mixed scanning".

A. Generic Environmental Categories

There are many ways to classify environmental variables. In practice a company will choose a model that has some affinity with its own corporate culture and management practices. The schema shown in Appendix D is based on a number of sources and may be regarded as a set of generic environmental categories. The following Sections are then a method of customizing and instantiating the schema.

B. Analyzing the Environmental Data

The problem is to select from a vast range of rapidly changing environmental factors those few that are critical to the company, and to introduce them effectively into the dialectical enquiry.

1. The Aims of Environmental Analysis

Hayes [1985: 112] argues that, under certain circumstances, the methodology of formal strategic planning and the organizational attitudes and relationships it cultivates can impair a company's ability to compete. The problems stem from the traditional "ends-ways- means" paradigm:

"... establish corporate objectives (ends); given those objectives, develop a strategy (ways) for attaining them; then marshal the resources (means) necessary to implement the strategy." [Hayes, 1985: 112]

His criticisms of this model as it is usually carried out are particularly relevant to IT strategy:

<u>Ends</u>: Companies often choose goals that are too short-term and hence tend to be episodic. Also, goals tend to be highly quantitative and they encourage managers in the belief that anything not quantitative is not important, and that the same goals have the same values for all employees at all levels of the organization.

<u>Ways</u>: Short term goals back companies into modes of thinking based on forecasts (what management thinks is going to happen) rather than on visions (what management wants to happen). Planning horizons become short and much more time is spent on "hard", measurable effort, e.g. new capital investment, or changing the organization chart, than on "soft" corporate culture issues, e.g. the rationale of executive appraisal and reward systems, or changing the organization's concept of "quality"

<u>Means</u>: Strategic planning tends to devote most of its attention to just one resource, finance, since this is readily transferable and convertible into other resources. Other resources, however, such as technology, market position, and organizational skills, are crucial precisely because they are not readily transferable, and a strategy based on buying them at short notice is seldom feasible.

<u>Logic</u>: The logic of ends-ways-means assumes that the world of competition is predictable; that reasonable objectives can always be achieved through purposeful activity, with measurable rates of progress; that organizational values and needs will remain stable over the planning period; that

managers can assemble resources in the required timeframe; and that responsibility for organizational success rests primarily on the shoulders of top management.

Hayes' [1985: 118] proposal is "to turn the ends-ways-means paradigm on its head: "means-ways-ends" In the context of the present Framework, his explanation can be interpreted as follows:

<u>Means</u>: A company should begin by investing in its IT capabilities along a broad front. It should invest in IT infrastructure and general-purpose applications that would be useful across a range of business activities. At the same time, IT decision makers should be developed in the specifics of their own domain and in a general appreciation of the other three domains. The company should acquire and experiment with new IT to an extent it believes it can afford, focusing funds and activity on a few critical technologies and systems but spreading them more widely throughout the organization.

<u>Ways</u>: As these capabilities develop, and as IT and market opportunities appear, the company should encourage managers and employees at all levels of the organization to identify and exploit congruencies between IT purposes and uses. Top management's job is "to facilitate this kind of entrepreneurial activity, provide it with resources from other parts of the organization, and where feasible encourage cooperative activities."

<u>Ends</u>: To develop business plans and then to seek IT capability will seldom succeed as a strategy, because of the uncertainty of resources and long development lead times. Instead, the company should selectively build IT capability in anticipation of likely business plans, and then encourage innovative ways of exploiting it. According to Hayes [1985: 118], the guiding force will not come from directives and controls, but rather from a balance between

integration and direction. The former arises out of a sense of organizational unity and camaraderie, and the latter out of shared values rooted in a long-term vision of the kind of company its people want it to become.

Thus the aim of environmental analysis is to uncover external opportunities and internal strengths that can be turned into means and ways (qualified by the need to manage threats and weaknesses) for a variety of ends that have at least some likelihood of arising in the future.

2. The Process of Environmental Analysis

Bates' [1985] framework covering the three stages of environmental analysis - monitoring, analyzing and predicting ("MAP") - is adapted in this Framework and extended to include both the internal and the external environment. In the Monitoring (or scanning) stage, environmental information is sorted into:

Environmental Variables: A first sorting of the information (i.e. customization of the schema in Appendix D) by corporate planning staff produces a list of all the factors that affect the company in some way.

Relevant Variables: A second sorting reduces the list to variables that have substantial influence on company strategies. These include "enabling" technologies with potential application in the organization, as well as "limiting" technologies which are unavailable or inadequate for company objectives. Participants in the dialectical enquiry are involved in this sorting, since it is closely related to their assumptions.

Critical Variables: Finally, a short list is produced of those relevant variables in which changes are expected to have a critical influence on the company in the period under consideration. This is instantiation, which involves assigning values and rates or directions of change to the variables.

(A fourth class contains "essential variables" - those which it is essential to consider, but which are not expected to change substantially in the period under consideration.)

Clearly, the classification of a variable can change over time, or as a result of changes in other variables, or as a result of changing assumptions. Also, at the start of the dialectical enquiry the classification of a variable from the business point of view may be quite different than from an IT point of view.

In the Analysis stage, the attempt is made to understand how the environment works, so that likely futures can be anticipated and desired futures planned for. Three kinds of relationship are examined:

Between Critical Variables and Global Variables: Are the critical variables affected by different political, economic, international and other global states? Do they have different impacts on the company according to the global states?

Among the Critical Variables Themselves: Changes in some critical variables may be associated with changes in others, a fact that would be of significance to planners.

Between the Critical Variables and IT Strategy: How and to what extent do the critical variables impact the potential purposes and uses of IT in generic competitive strategies and organizational designs?

It follows from the means-ways-ends logic, that these relationships are examined not simply to predict future trends, but more importantly to discover levers through which the variables may be controlled, when they can be controlled.

Ein-Dor and Segev [1978], exploring the relationships between organizational context variables and the "success" of management information systems, highlight the significance of the controllability of a variable. An IT proposal (for a policy or project) should be rejected if the uncontrollable variables add up to a "hostile" environment for the proposal, or if the partially controllable variables are not sufficiently tractable to create an at least partly "benevolent" environment. Hence, in the Prediction Stage of the adapted MAP process, future trends in the critical variables are predicted and such levers for controlling them as exist are specified.

It should also be remembered that environmental variables are often uncontrollable only in the short term, or for a given proposal, or under certain general conditions. IT itself can make the relevant variables more controllable, by making it possible to tailor the planning information to the company's planning orientation [Ewusi-Mensah, 1985: 113-114], and by expanding the "bounds of rationality" of the planners [Bakopoulos & Treacy, 1985: 5-7].

Bates [1985] gives a number of diagrams to show how changes in critical variables are associated according to the three kinds of relationship listed above. In addition, Figure 7 of this Framework presents a schema for simplifying the environmental changes into a few "forces of change", which may then be analyzed using a technique such as the "force field analysis" of organizational development [Thomas, 1985].

The logic of Figure 7 is as follows:

> The Boxes labelled A., B., C. and D. represent relevant variables in the four generic categories of Appendix D, with the critical variables represented by the inner Boxes.

The practical assumption underlying the Figure is that the forces of environmental change can usefully and validly be resolved into a flow line linking the four Boxes.

Political, Social and Economic Forces: These represent changes in the external system of opportunities and threats (Appendix D, Section I.A.) that will have so significant an effect on the company that they should be considered critical variables.

Pressures for IT Solutions: Many of these changes demand IT solutions, or challenge the effectiveness of IT as a source of solutions. For example, some marketing plans are feasible only on the assumption that certain levels of computing power and functionality will be available. On the other hand, the threat of political sanctions has to be taken into account when devising the IT support plan.

Technological Forces: To the pressures for IT solutions must be added the opportunities and threats that arise in the technological world itself (Appendix D, Section I.B.). Much of the turbulence in the business environment is attributable to these very forces [Anderson G.G., 1985; Cymbala, 1984].

External Environmental Pressures: These represent the combined effect of changes in the business and IT external variables on the critical internal organizational variables. The line flows from Box B because, in this Framework, the pressures are considered only in terms of their IT significance. The line flows to Box C because, in this Framework, pressures on the IT domain are considered only in the overall context of organizational design.

Internal Business Forces: These represent changes in the internal system of strengths and weaknesses (Appendix D, Section II.A.) that will have so significant an effect on the organization that they should be considered critical variables. Some of these changes are generated by the external pressures, and some by changing assumptions and conditions within the company.

<u>Organizational</u> <u>IT</u> <u>Learning</u> <u>Pressures</u>: Many - often, most - of these changes demand IT solutions, and challenge the competence of the IT domain to provide the required support. Since decision makers in the IT domain have the power to enhance or inhibit the three kinds of congruency identified in Figure 4 - competitive strategy and organizational design; distinctive competence and decision making competence; the purposes and uses of IT - the pressure is on them to develop their own "adequacy" (Section 4.1.III.B.) in pace with company development.

<u>Internal</u> <u>IT</u> <u>Forces</u>: To these organizational learning pressures must be added the forces that arise within the IT support functions themselves (Appendix D, Section II.B.). Much of the turbulence here is attributable to changes in traditional IT job designs and careers induced by the new technologies, and to the increasing numbers of non-technical people who are becoming involved in decisions that traditionally were regarded as the preserve of IT specialists.

3. The Rationale of Environmental Analysis

To what extent can decision makers indeed shape the company's IT future, and to what extent are they compelled to follow a course set by forces beyond their control? In considering questions such as these, Etzioni [1967: 385] describes two extreme points of view that give different weights to the conscious choice of decision makers:

<u>Rationalistic</u> <u>models</u>: According to these models, decision makers have a high degree of control over their decision

making situation - problems can be defined, goals set, alternatives weighed, and the best course chosen [Minkes, 1987: 60-62].

Clearly, such a model cannot work when the problem is ill-structured. Moreover, it is not usually possible to collect and process in the time available all the detailed information necessary for a completely rational decision.

Incrementalist Approach: The "science of muddling through" or "logical incrementalism" described by Lindblom [1959] and others [Minkes, 1987: Ch. 4; Quinn, 1984] prescribes the handling of problems as they arise, a step at a time. The approach is closely related to Simon's [1976] theory of "the limits of rationality" that bound the ability of administrative man" to make rational decisions. Its aim is to adapt decision making to the limitations of the decision makers, and to reduce the scope and cost of collecting information. Decision makers do not attempt to survey and evaluate all alternatives, but focus only on those policies that differ incrementally from existing policies. Incrementalism cannot, however, be applied to "large" or fundamental decisions, such as the commissioning of a major IT project.

Neither approach in its extreme form is likely to satisfy managers who are determined to create, as far as they may, their own IT future, but who nevertheless understand the realities both of rapid and complex environmental changes and of the limits to their own problem solving ability [Simon, 1976: 39-41]

Etzioni proposes instead a "mixed-scanning" approach to environmental analysis, which combines several levels of scanning, including a broad, comprehensive level (so that no major option will be left uncovered) and a highly detailed level (so that the selected option can be explored as fully as is feasible)." [Etzioni, 1967: 389]

In a mixed-scanning approach to environmental analysis, it is essential to distinguish fundamental from incremental decisions. Fundamental decisions are made in response to the main alternatives perceived, but without details and specifications. Incremental decisions are made within the context set by the fundamental decisions, on the basis of detailed specifications.

This approach to environmental analysis is consistent with the principle of "directed incrementalism" described in Section 4.1.III.D.4.

C. The Effects of Corporate Culture

The internal political and cultural factors of the company will affect several critical aspects of strategic IT decision making:

The quality of the business and IT managers' participation in the dialectical debate.

The quality of their business vision for IT, and the range of potential purposes and uses of IT they are capable of generating.

Their evaluation of the strategic importance of IT, the focus of the IT investment, and the kind and scale of competitive advantage aimed at.

The acceptability of the notion of a target environment, of systems architecture and its incremental implementation, and of company-wide participative decision making.

The quality of the implementation plans business and IT managers are capable of carrying out, and their ability to grow as competent strategic IT decision makers.

In this Framework, the specific strategic task with regard to these factors is to create conditions of internal "organizational health" (Section 4.5.I.) that will permit IT strategy to be formulated in good dialectic and implemented as a planned, company-wide organizational development effort. The following conceptual frameworks can help in carrying out this task:

Miller and Friesen's [1977] analysis of "organizational archetypes", as a basis for assessing what the management attitude is likely to be to the notion of IT-induced changes in company strategy, and how acceptable participative strategic decision making is likely to be.

Schein's [1984] three levels of culture - visible artifacts, values, and underlying assumptions - as an aid in uncovering the factors that determine success or failure in defining the Target Environment Architecture and in setting the course and pace of organizational development and learning.

Argyris' [1971] discussion of the roles of rationality and emotionality in managerial behaviour. Some people do not accept the practicality of "big picture" comprehensive planning, or "synoptic formalism" [Camillus, 1982]. Others feel threatened by the encroachment of IT into all corners of the organization [Business Week, 1983].

Deshpandé & Parasuraman's [1986] mapping of Deal & Kennedy's "corporate tribes model" to the Boston Consulting Group's growth/share matrix and the traditional 4-stage business/product life cycle (Section 4.3.IV.A.; Figure 12).

D. <u>Corporate IT Scenarios</u>

In the Context Component, decision makers' assumptions and critical environmental data are synthesized into sets of options, through dialectical enquiry. In the Content Component, one of these sets of options will be selected, and from it an IT strategy will be built.

> "The fundamental activity of corporate planning is the initial choice of which strategic projects are to be undertaken. Once that has been determined, all subsequent activities within the strategic process from the invention of relevant objectives to the formulation of detailed work procedures are the implementation of that initial decision." [Hoffman, 1985: 66]

The purposes and uses to which all the IT resources of the company will eventually be put "are uniquely determined at the point where certain environmental opportunities are accepted, while others are rejected."

In this Framework, one or more Corporate IT Scenarios document the major option sets. The approach is much the same as that generally found in business planning practice [Hoffman, 1985; Klein & Linneman, 1981; Leemhuis, 1985; Linneman & Klein, 1979, 1985; Zentner, 1982]. The focus, however, is on the purposes and use of IT in the company's strategy, and the planning orientation is interactive rather than preactive (Section 4.1.III.A.).

If multiple scenarios are prepared, one of them should be the "reference scenario" [Ackoff, 1981: 101]. This is a scenario based solely on the predictions of the MAP process, i.e. excluding the levers of control. It describes the future the company would most likely have if it continued on the basis of the apparent assumptions underlying its current IT policies and projects, and if it did nothing to attempt to control its environmental variables, internal or external. The other scenarios represent likely futures if assumptions are changed and/or environmental variables controlled. They are bases for the "idealized design" [Ackoff, 1981: App. 2] of a target environment.

Possible contents of a Corporate IT Scenario include:

<u>Business Background</u>: A summary of the critical variables

in Box A. of Figure 7, and the corresponding assumptions. This describes a potential operating environment, and management assumptions and aims relevant to it.

<u>IT Background</u>: A summary of the critical variables in Boxes B. and C. of Figure 7, the "Pressures for IT Solutions", and the "External Environmental Pressures", together with the corresponding assumptions. This culminates in a broad outline of technologies and business systems likely to be feasible and profitable to this company in this environment. Reasons are given for excluding some technologies and including others, with assumptions relating to future technological advances.

<u>IT Competence Profile</u>: This is a list of the company's major IT-related strengths and weaknesses, rated with respect to its strategic targets - suppliers, allies, customers and competitors. The competence profile is a basic reference document in the development of a truly feasible IT strategy.

Ansoff [1968: 89-93] gives general guidelines for the contents of a competence profile. In the present Framework, these can be reduced to a summary of the critical variables in Box D. of Figure 7, and of the "Organizational IT Learning Pressures", i.e. what is being asked of people in the IT and business domains, what they are currently capable of delivering, and what they yet have to learn if the environment envisaged in this scenario is to be realized. This part of the scenario can be prepared either as input to or as part of the assessment of the company's historical stage of development (Section 4.6.III.).

The material is best presented in a form to which managers and employees can readily relate, e.g. a narrative describing "A Day in the Life of an Insurance Consultant". "Business theatre" is also being used effectively (e.g. by IBM) to dramatize the impacts of IT on office and factory situations.

The picture may also be presented at different levels of detail. Beck [1982: 17] describes how the Shell approach has evolved in this direction. This company has swung increasingly away from a mechanistic methodology and centrally-set forecasts, towards a more conceptual or "qualitative" analysis of the forces and pressures impinging on the industry as a whole and on particular areas of decision making within particular business sectors. Shell planners try to identify the key elements pertaining to a particular area of decision making, and to translate these into a framework for individual judgment. The higher the level of management, the more interested they are in "global scenarios" of world-wide developments. The focus becomes narrower as one proceeds into the more specialized functions, divisions and business sectors.

The Corporate IT Scenario is the crucial link between the Context and Content Components. Success in strategic IT decision making as envisaged in this Framework will be proportional to the care and trouble taken to prepare an effective scenario. The reasons for this are twofold.

Firstly, the kind of decision making envisaged in the Framework aims at restructuring the strategic posture of the company through the use of IT, to meet the restructuring of the competitive environment brought about in large measure by IT. The essentials of what a Corporate IT Scenario should help managers understand and do can be summarized in Anderson G.G.'s [1985] terms as follows:

> Appreciate the competitive value of environmental information: learn to sense weak signals of change and gain as much lead time as possible to respond with new policies or actions; extend the span of sensitivity to sources of change, opportunities and threats; take into

account the blurring of dividing lines between industries and markets.

Put enough resource into long-range R&D, bearing in mind that other companies can emulate, develop, licence or acquire competitive technologies.

Recognize the fact that information is an increasingly important element in all products and services of the company, and that consumers will need co-operation and training in making use of these added features.

Restructure the strategic decision making process to reap the full benefits of participation and evaluation. Build a technology infrastructure and management procedures to ensure that information can flow easily among the company's operating units.

Establish a centrally defined focus, but decentralize responsibility for the details and the carrying out of strategic IT decisions.

Secondly, the ultimate aim of the Framework is to "help individuals unfreeze and alter their theories of action so that they, acting as agents of the organization, will be able to unfreeze the organizational learning systems that also inhibit double-loop learning" [Argyris & Schön, 1978: 4]. This will happen when managers accept that a strategic IT decision making exercise is not a single programme with clear-cut functional responsibilities and cause-effect solutions, but a never-ending, company-wide multiplicity of processes, based on producer-product relationships that are not "environment free" but rather "environment full" [Ackoff, 1981: 21].

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4.3 DECISION CONTENT

I. THE BUSINESS VISION FOR IT

The Corporate IT Scenario produced by the dialectical enquiry of the Context Component helps in visualizing what an appropriate IT strategy for the company should be, but it does not represent a strategy statement in and of itself. Rather, it is like a skeleton to which must be added connecting muscle and tissue to produce completed strategy statements [cf. Hofer & Schendel, 1978: 42].

Following the Hofer & Schendel guidelines, completed IT strategy statements can be said to have four necessary characteristics:

They should describe each of the major components of the business strategy as it is affected by IT.

They should indicate how IT will help achieve the company's planning ends (ideals, objectives and goals).

They should be stated in generic rather than physical terms, so that they cover all three planning timeframes and are not merely a short-term plan for specific goals.

They should be as precise as possible, so that they provide meaningful directives for action plans.

Statements at the meta- and macro-architectural levels of discourse (Section 4.1.III.D.4.) are both generic and precise. They define the boundaries of the problem, have many implications for further analysis and planning, but leave the detailed micro-architectural statements to emerge in time.

The Content Component provides a framework - the "quadrants of IT strategy" shown in Figure 8 - to help IT decision makers flesh out the skeleton of the preferred Corporate IT Scenario, and develop a single, unified business vision of the role of IT in the company's business strategy.

Both Figures 7 and 8 have been suggested by the way EwIM links the concepts of decision making domains, environmental pressures as opportunities and inhibitors in IT strategy, and "impact" vs. "alignment" IT strategy [Benson & Parker, 1985: Figs. 10, 11, 12].

All three of these concepts are brought into the Framework, but the strong association EwIM makes between impact IT strategy and external pressures, and between alignment IT strategy and internal pressures, is not made here. Instead, all the critical environmental pressures are linked along the flow line of Figure 7. The distinction between impact and alignment strategy is seen as a matter of management choice, i.e. the extent to which they will allow the decision making context (external or internal environment, data or assumptions) to change the mission, business strategy and organizational design of the company.

The point is illustrated in Figure 9. The distinctive competence of a company relative to its competitors lies in the way it makes and markets its product, administers the organization, and deploys its IT and other resources.

In alignment strategy, the role of IT is functional or tactical - it supports a business strategy that has been laid down relatively independently of IT considerations. To the extent that a technology strategy specific to IT can be said to exist in the company, it would be a functional area strategy [Hofer & Schendel, 1978: 29], not a corporate strategy. The elements of which it is composed, e.g. positioning, infrastructure, systems, all focus on improving the effectiveness of the organizational structures and processes as already configured. IT management will itself have tactical plans which, at a lower level of the organization, represent the strategies of decision makers in the technical sub-areas. Even in alignment strategy, these management strategies are critically affected by the "External Environmental Pressures" of Figure 7.

In impact IT strategy, on the other hand, environmental pressures in general and IT pressures in particular alter the way the company deploys its resources, administers the organization, and makes and markets its products. Hayes' means-ways-ends inversion (Section 4.2.IV.B.1.) becomes a significant consideration, and IT technology strategy thereby becomes an integral part of the business strategy itself. The architecture of the target environment (Section 4.1.II.A.3.) extends beyond the issues of IT infrastructure and application systems to cover also:

> The organizational design, i.e. a configuration of generic organizational structures, processes and jobs that ideally fits the mission and competitive strategy.
>
> The human resources, i.e. an ideal structuring of generic decision making roles and responsibilities in IT strategy.

The organizational and technical strategies for managing IT remain functional, but are now a level nearer in importance and visibility to top management.

Returning to Figure 8, the significance of the quadrants of IT strategy may be described as follows:

> <u>External Pressures</u>: Either IT developments themselves cause the external pressures, or it is to IT that the company turns for the means of coping with the impacts. Appropriate management response is required in both the business and the IT domain, and this is represented by Boxes A and B.

Box A - Competitive Strategy: Probable points of impact on the company will have been described in the Corporate IT Scenario, and company mission, objectives and competitive strategy must now be analyzed in this context. This should lead to an understanding of the generic purposes to be served by IT in supporting the company's competitive strategy (alignment IT strategy) or in shaping it (impact IT strategy).

Box B - IT Positioning: Defining IT purposes requires an evaluation of the relative importance to the company of IT in general, and of specific information technologies. The result of this evaluation is an "IT Positioning Statement". IT positioning [Jarvis, 1985] is closely related to the marketing strategy concept of "product positioning" [McCarthy, 1978: 249] and the strategic management concept of "business unit positioning" [Robinson, 1986: 494-497]. It is part (or, in some industries, the whole) of a company's overall technology positioning, which specifies exactly which technologies are envisaged in the definition of its business, and at what stage of the technological life cycle the company will usually want to adopt innovations [Ansoff, 1987].

In the case of IT, which is a general purpose technology, the major business areas on which the IT investment programme will focus must be stated, as well as the kind of competitive advantage it is hoped to gain thereby, i.e. the unique position the company will develop vis-à-vis its competitors, through the pattern of IT skill and resource deployments [cf. Hofer & Schendel, 1978: 25].

Internal Pressures: Following the flow line of Figure 7, internal pressures can be seen as partly the consequences of external pressures, and partly the results of internal changes in management and staff assumptions as to how the company should be administered. In either case, the demand is for a better match of internal human, financial and IT resources to business objectives. Appropriate management action is required in both the business and the IT domain, and this is represented by Boxes C and D of Figure 8.

<u>Box C - Organizational Design</u>: Once again, likely points of impact on the organization will have been described in the Corporate IT Scenario, and analysis of the organizational design in this context must follow. A more precise understanding of how different generic organizational designs best support different generic strategies will be sought. This should lead to an examination of the generic uses of IT in supporting effective organizational designs (alignment IT strategy) or in shaping them (impact IT strategy). These in turn define the IT contribution to the company's strategic capability, in terms of technological infrastructure, organizational structures and processes, application systems, and decision makers' competence.

<u>Box D - IT Strategy</u>: The strategy to achieve competitive advantage through IT falls into two parts: a technology (or capability) strategy, expressed in terms of a Target Environment Architecture to be implemented incrementally; and a management strategy, expressed in terms of the stages of organizational transition through which the company must pass in its progress towards the target environment.

In summary, the quadrants of IT strategy shown in Figure 8 indicate four major, inter-related tasks for IT decision makers:

To apply IT in support of the company's competitive strategy, in innovative ways.

To use it to enhance the effectiveness of the company's organization, in a manner that anticipates, i.e. foresees and acts in advance of, future competitive strategies.

To position the company to exploit and assimilate IT as appropriate to these needs.

To manage the IT functions and resources, and their application to organizational design, effectively and efficiently.

II. COMPETITIVE STRATEGY

There are many ways of defining strategy in business (see, for example, Hofer & Schendel [1978: Ch. 2]). In their effort to arrive at a general framework for research into the co-ordination of IT and business strategy, Bakopoulos & Treacy [1985] propose three levels of strategy that can be supported or shaped by IT:

Business Portfolio Strategy: The choice of industries to compete in, and positioning the company to do business in those industries.

Competitive Strategy: Competitive moves within the industry in which the company does business.

Internal Strategy: The development of an efficient and effective organization for achieving objectives and goals.

Because of the particular concepts of business strategy used in this Framework (Porter's [1980] "strategic forces" and "generic competitive strategies", and his [1985] "business unit value chain"), portfolio strategy is included in "competitive strategy", and internal strategy goes under the name "organizational design". Competitive strategy and organizational design together constitute the business strategy.

This quadrant, therefore, represents the first step in defining the role of IT in the business strategy. It requires a detailed analysis of the critical environmental influences agreed on in the Corporate IT Scenario, in order to uncover the underlying economic and management principles on which the strategy is to be built. Using these principles, either intuitively or in a procedure such as King's [1978] "strategy set transformation", strategic options for the deployment of IT in the competitive strategy can be "generated" [Wiseman, 1985: 57]. The selected options are defined to be the "purposes" of IT in supporting the competitive strategy (alignment IT strategy) or in shaping it (impact IT strategy).

A. Strategic Impacts of IT

Accounts of the use of IT as a "competitive weapon" have proliferated in the literature in recent years (see, for example, Barrett & Konsynski [1982]; Benjamin, Rockart, Scott Morton & Wyman [1984]; Business Week [1984(1), (2)]; Crowston & Treacy [1986]; EDP Analyzer [1984(1); 1984(2)]; Harris [1985]; Harvard Business School [1983]; Ives & Learmonth [1984]; Life Office Management Association [1984]; McFarlan [1984]; Meyer & Boone [1987: Part 2]; Orzell [1983]; Parsons [1983]; Porter & Millar [1985]; Wiseman [1985]; Wiseman & MacMillan [1985]).

When studying such stories systematically, it soon becomes clear that there are four ways in which IT can have a fundamental impact on a company: its core purpose or mission; its market share and growth; its economic role as a creator of value; and its wider role in the social, economic and political context.

1. The Core Purpose of the Company

IT can enhance or extend a company's products, services and markets beyond its traditional range, and thus alter the core purpose of the company. In South Africa, for example, IT has already extended Old Mutual's range of products and services beyond the traditional insurance, pensions, investments and property lines to include the provision of information (e.g. the Beltel services), administrative services (e.g. administration systems for pension scheme clients) and technology (e.g. software and data communications for brokers).

IT can also cause a shift away from the existing product line to something else entirely. For example, Dun & Bradstreet developed from a credit reporting company to become one of the largest information services corporations in the world, controlling inter alia the McCormack & Dodge software house and forming alliances with other IT suppliers, such as IBM, Lotus and Multimate [Wiseman, 1985: 10-15].

It follows from the above that the current organizational structures and processes of the company are not infallible guides to the information systems that may be required in the future, and consequently that the findings of conventional information systems requirements analysis (see Davis [1982] and Yadav [1983] for overviews of current techniques) may well be out of date before systems implementation is completed.

Strategic IT decision making must consider quite fundamental organizational constructs if it is to provide the company with the capability to assimilate new technologies and develop new systems for business strategies that have yet to emerge. At the very least, the decision makers will revisit the basic questions: "What industry are we in? What markets do we serve? How are these likely to change? What will the effects be on the way we do business?" These questions lie as much in the field of strategic IT decision making as they do in the areas of business unit definition and product/market portfolio planning where they originate [Abell, 1980; Porter, 1980: Ch. 7; 1985: Ch. 7; Robinson, 1986: Chs. 2 & 18].

2. Market Share and Growth

IT creates conditions for a market to be intensely competitive on the basis of frequent product or service innovation, and for successful companies to grow across either a narrow or a broad range of customers and distributors. This effect stems largely from the fact that data processing and communication technologies allow information to be aggregated and transactions to be consummated virtually instantaneously, regardless of time, place or organizational and industry boundaries. Naisbitt [1984: 22-26] refers to this as the "vanishing information float".

For example, the financial services industries are growing and changing at prodigious rates, overseas [Mackenzie, 1986: 74-77] as well as in South Africa. Boundaries are continually shifting both internally (e.g. the merging of banking, broking, life insurance and savings services) and externally (e.g. the entry of retailers like Sears Roebuck into the market). Competition is intense on the basis of integrated accounts and services in which complex transactions are concluded in a matter of seconds.

To be successful under such conditions, the company has to be both reactive and proactive in its business strategies. It must react rapidly and effectively to changing customer needs, and indeed to changing definitions of who the customers are. At the same time, it must anticipate these changes and take positive steps to place existing rivals at a disadvantage, block new rivals and substitute products, and bind its customers and distributors to it.

IT applications used for such purposes will extend beyond the boundaries of the company, supporting backward integration into the supplier chain, forward integration into the distribution chain, strategic alliances with other organizations, and the gathering of market intelligence [Cash & Konsynski, 1985].

Insurance companies in South Africa, for example, are forging

IT-based relationships with distributors (e.g. the broker network project of the Life Offices Association), with end users (e.g. information services through Beltel), with the sources of business information (e.g. the Reuters database, the Johannesburg Stock Exchange), and with financial clearing services (e.g. the Automated Clearing Bureau of the commercial banks).

Different kinds of system linkages can be established - for example, simple data exchange between a supplier and a buyer, or a shared, jointly funded data processing installation, or a joint customer network, such as airline reservation and electronic funds transfer systems.

A company embarking on an inter-organizational system as a basis for growth and extending market share has to take into account the high potential for conflict of interest between itself and the other participants in the system, who have the same objectives. For example, a consortium of the S.A. Post Office and a number of financial institutions had for some years been planning the introduction of a joint network of automatic teller machines, SASWITCH. It would seem that at a certain stage some of the participants re-evaluated the progress of the project, the market opportunities as they saw them, and their own IT capabilities compared with those of the other partners. They came to the evidently correct conclusion that they could steal a march on their partners/competitors by establishing their own network, MULTINET, well ahead of the SASWITCH launch.

Thus a company will enter into a joint IT venture with suppliers, distributors, customers or competitors because of the match it perceives with its strategic objectives (e.g. market share and growth), and with its criteria for cost, benefit, risk, and operating effectiveness. The other parties will have similar objectives and criteria, and these must clash sooner or later with the company's own. If the partners are competitors, the conflicts will be more than simply technical or operational.

It is clear, then, that strategic IT decision makers need to analyze the competitive strategy and external operating policy of the business, and assess whether the risks of market-orientated extensions of the IT infrastructure are justified by the expected gains [cf. Hofer & Schendel, 1978: 194-195; Porter, 1980: 44-46].

3. The Creation of Value

The ultimate aim of any competitive strategy, whether based on product differentiation and a premium price or on low cost leadership and a competitive price, must be to give the customer better-than-market-average value for money and the company better-than-industry-average return on total capital employed. Porter & Millar [1985] have shown how IT can be an effective means of achieving these ends:

> <u>In the Market</u>: By creating a more responsive organization that delivers product and service more effectively, or by controlling the distribution channels ("downstream value").
>
> <u>In the Industry</u>: By creating an operationally superior organization that deploys its IT and other resources more efficiently, or by controlling the supply lines ("upstream value").

There is, however, the risk that the company will run into financial problems if it invests heavily in IT but fails to achieve these effects. Depending on the intensity of competition in a given market (financial services, for example), all the players may be reaching for ever higher levels of distinctive competence, but using essentially the same information technologies. As a result, the mandatory level of a company's investment in IT may rise sharply in relation to its human and other resources as it attempts to maintain technological parity with the competition.

According to the law of variable proportions in microeconomics

[Koutsoyiannis, 1979: 82], time, development of the human resource, and a commensurate growth in the scale of operations, may be needed before a company can expect an acceptable rate of return on its strategic investment in IT. But this development and growth may fail to materialize, if, for example, the company is less effective than others in developing its human resources to the extent required to restore optimum technological returns to scale. Moreover, two companies may have comparable IT and administrative human resources, and hence the same technological returns to scale, but different relative levels of output (i.e. sales) owing to differences in entrepreneurial and marketing effectiveness.

It is clear that the use of IT as a strategic tool to create value calls for an investigation into the production economics of the company. Porter and Millar [1985] discuss the concept of "information intensity", i.e. the contribution of the information systems relative to the human systems and other components in the creation of products and services. A strategy that depends on increasing the information intensity of either the production process or of its end product demands a clear understanding of the underlying (microeconomic) production functions - for example, whether returns to scale are increasing, decreasing or constant, and what the implications are of changing the various factor intensity ratios [Koutsoyiannis, 1979: 84].

4. The Social and Political Context

Every company has a role to play in the political, economic and social development of the country in which it operates. This is inherent in the generally accepted meaning of the phrase "issues management" [Zentner, 1984], and it has a particular relevance in IT issues management (as characterized by, for example, Boynton & Zmud [1987], and Dansker, Hansen, Loftin & Veldwisch [1987]).

In South Africa, discriminatory regulations (particularly those relating to education and residence) severely restrict the recruitment sources available in both the business and the IT domain. In the the business domain, some of the challenge can be met through innovative uses of IT in:

Creating and delivering products and services, on a profitable basis, to lower-income market segments that might not otherwise have been able to afford them.

Providing bridging education for new entrants into job markets to which they have previously been denied access, and for which their school career has not prepared them.

Providing tools and processes that raise human productivity and service levels (minimally as prostheses, optimally by enhancing human potentials).

> "In the South African context, it is important that computers should enhance productivity and service, and improve the viability of businesses. They should create jobs rather than replace them." [Van der Horst, 1986]

In the IT domain, bridging education can be aimed at bringing candidate development and operational personnel to the point where they can enter the ordinary technical training courses on equal terms with others. Initiatives in this direction have already begun, such as those of the Computer Users Council of South Africa, the Infogold Division of the Anglo-American Corporation, and Zukheni, a Johannesburg-based self-help organization for programmer training.

There can be no doubt about many employees' sense of frustration and alienation (i.e. domination by the system and separation from business ideals [cf. Wood, 1981: Ch. I]) brought about by acts of political, social and economic discrimination over which the company has no control. It would be appropriate in a dialectical approach to organizational development and computer manpower planning to explore whether and to what extent genuine participation in the transformation of the "production relations" [Wood, 1981: 66-87] of the company - its economic production functions (or value chains), its generic organizational processes, and the relationships among the decision making domains - can help overcome alienation.

B. Strategic Purposes of IT

1. Company Mission and Objectives

Company mission and objectives can be interpreted in two ways: firstly, as the social and economic purposes society establishes for enterprises and, secondly, as the purposes of the company that its managers explicitly or implicitly determine [Steiner & Miner, 1977: 99]. In a healthy organization operating in a healthy business environment, the latter would flow from the former, so that, ordinarily, practical IT decision making can focus on the latter interpretation. In South Africa, however, it is always necessary to test strategic decisions against the former interpretation.

In this Framework, to ensure that the analysis does not extend too far from the specifically IT issues it is recommended that the company's mission and its long-term ideals be considered together. In many companies, indeed, there is no documentation of long-term ideals separate from the mission statement, and in such cases it is important not to mistake medium-term objectives and short-term goals for ultimate ideals.

By definition, both mission and ideals are set beyond the short- and medium-term planning horizons. Strictly speaking, they are not achievable since they are not bounded.

> "... it is never possible to maximize profits as there always will be some profitable options that might have been pursued that were not. Similarly, one can never achieve

survival, since bankruptcy and death are always possibilities in the future." [Hofer & Schendel, 1978: 21]

In precisely the same way, the ideal target environment of the IT strategy is unbounded and unachievable, but remains nevertheless a valid and practical concept in the planning process.

Taken together, mission and ideals do reflect the purposes of the company, and it is clear from the four key points of impact discussed in the preceding Section that the purposes of IT will be closely interwoven with these. Five elements of company mission and ideals, which may or may not be explicitly documented, need to be analyzed [cf. Bower, 1982(2): 632; Pearce, 1982: 17]:

<u>The Definition of the Business</u>: The portfolio of products and services (customer functions), the consumers and markets served (customer groups), and the alternative technologies, including IT [Abell, 1980: Ch. 7].

<u>The Production Economics</u>: The way the company uses its technologies (IT in particular) and other resources to produce its product and deliver it to the markets.

<u>The Maturity of the Company</u>: The company's experience in its line(s) of business and in the strategic deployment of IT, as well as the competence of its strategic IT decision makers.

<u>The External Operating Policy</u>: The way the company does business with suppliers, distributors and customers, cooperates with allies, and handles competitors.

<u>The Success Criteria</u>: The generic organizational, financial, social and other criteria that reflect the company's intention to survive and develop, effectively,

morally and profitably.

2. Generic Competitive Strategy

Many frameworks have been proposed for characterizing competitive strategy, and useful overviews are given by Belohlav & Giddens-Emig [1987], Galbraith & Schendel [1983], Gluck [1985], Herbert & Deresky [1987], Hofer & Schendel [1978: Chs. 4 and 5], Karnani [1984], Payne [1986], and White [1986]. The present Framework relies on Porter's concepts of "competitive forces" and "generic strategies".

According to Porter [1980: 4], there are five generic competitive forces that determine a company's ability to attain its strategic objectives: the bargaining power of its suppliers; the bargaining power of its buyers (i.e. customers and distributors); the intensity of rivalry among existing firms in the industry; the threat of new entrants into the industry; and the threat of substitutes for its products or services.

From these generic forces, Wiseman [1985: 52-57] derives three "strategic targets", at which the competitive strategy of a company must be aimed:

> Suppliers: For example, raw materials, parts, finished goods, organized labour, finance, accommodation, transport, utilities, insurance and other services.
>
> Customers: Both the end-users and "channel" users, e.g. distributors, assemblers and resellers.
>
> Competitors: Traditional rivals already in the market (competing for the same customers) or in the industry (competing for the same factors of production); potential new entrants into the market or industry; and companies threatening substitute products.

By posing questions about the uses of IT such as those suggested by McFarlan [1984: 99-101] and Parsons [1983: 7-10], it is already possible at this first level of analysis to gain intuitive insights into the possible purposes of IT in competitive strategy.

<u>Suppliers</u>: Can IT change the balance of power in supplier relationships? For example, applications such as "just in time" delivery systems, or using IT as an alternative to highly priced labour, or linking computer-assisted design systems to supplier databases, can place the company at a distinct advantage in its negotiations with suppliers.

<u>Customers</u>: Can IT build in switching costs? For example, it may be a relatively simple matter for a customer to start using an online order entry system. As more and more of its features and functions are used, however, complexity grows and with it an extreme reluctance to start learning the equivalent systems of competing suppliers.

<u>Competitors - Traditional Rivals</u>: Can IT change the basis of competition? For example, a company can gain on its rivals by using a system that provides better market data or denies rivals access to market data. Similarly, a system may improve the efficiency of a company's distribution channels (alignment strategy), or fundamentally change the entire distribution concept (impact strategy), as when automatic teller machines brought commercial banking services into the street, on a 24-hours-a-day basis.

The technological lead <u>per se</u> may be short-lived, but the gain in competitive position can be sustained if the early move down the experience curve [Robinson, 1986: Ch. 9] gives the company lasting cost leadership. Cases have also been reported [McFarlan, 1984: 100] where IT has enabled product features to be changed so radically from the existing line that they cause the prevailing generic competitive strategy in the market to change permanently, for example from cost leadership to differentiated product features.

Competitors - New Entrants: Can IT build barriers to entry? A further effect of ensuring customer loyalty through complex and costly "value-added" systems features is that it makes it difficult and expensive for new competitors to tool up for effective entry into the market.

Competitors - Substitute Products: Can IT generate new products? By changing the information intensity of a product or service, IT can induce such radical improvements in quality, features, production economics, delivery time, and so forth, that the outcome is effectively a new item. Sometimes, the global effect is to eliminate an entire industry, as when electronic calculators replaced electro-mechanical calculators [Parsons, 1983: 8].

It must be remembered that the use of IT as a defensive or offensive weapon against a strategic target can equally well be applied in the same or the opposite mode against the company. Moreover, using IT in this way can require high levels of capital investment and running costs, entail high risk of failure through planning errors or effective retaliation by the target, and create severe short-term to medium-term rigidities in the company's technical infrastructure and organizational processes.

According to Porter [1980: 35; 1985: 11-16], there are three generic competitive strategies a company can adopt in dealing with the competitive forces: differentiation of the company, its product or its service; low cost leadership in making, delivering and supporting the product; and competitive scope or focus, in terms of which a broad arena or a narrow arena (a "niche") may be chosen. Broad competitive scope can be achieved through organic growth beyond the current segment, through the acquisition of other businesses, or through alliances with other organizations, while a niche would be maintained by restricting the terms of company mission and protecting its operating "turf".

The key dimensions to competitive scope are: the horizontal spread of product and market segments covered; the vertical integration of functions, backward into supplier industries or forward into distributor and buyer industries; and geographical coverage.

The three generic strategies taken together with the generic targets allow questions such as those described above to be sharpened to yield deeper insight into the purposes of IT in competitive strategy. Figure 10, based on Cash and Konsynski's [1985] discussion of inter-organizational systems, shows examples of how this can be done.

Wiseman [1985, 42] separates "scope" into "growth" and "alliance", and adds a fifth strategy "innovation". The latter is not a logically independent concept, but it is a strong enough stimulus to creative thinking to deserve a category of its own. The net result is a set of five "strategic thrusts": differentiation, cost, innovation, growth, and alliance.

According to Ansoff, DeClerck & Hayes [1976: 42], a company can relate to its environment in two distinctive modes:

> Competitive Mode: The company seeks to make its goods/rewards transactions with the environment profitable by producing as efficiently as possible, and by securing the highest possible price and market share.
>
> Entrepreneurial Mode: The company seeks to replace obsolete products and/or markets with new ones which offer higher potential for future profits. It does this by identifying areas of new demand, developing responsive products and appropriate manufacturing and marketing

capabilities, market testing, and introducing the (new) products to the (new) markets.

Alignment IT strategy is characteristic of the competitive mode, and impact IT strategy of the entrepreneurial mode.

In this Framework, the concepts of strategic targets, generic strategies and the mode of deployment provide the operational dimensions of the purposes of IT in competitive strategy. They are shown as the first three steps of the "Strategic Option Generator" in Figure 11, which has been adapted from Wiseman [1985: 57]. (See also Appendix E.)

III. ORGANIZATIONAL DESIGN

This quadrant of Figure 8 represents the second major step in defining the role of IT in the business strategy. It requires detailed analysis of the environmental impacts on organizational effectiveness identified in the Corporate IT Scenario (Section 4.2.IV.C.). Following the argument of Figure 4 (Section 4.2.I.), organizational effectiveness can be examined in terms of the congruency between the organizational design and the competitive strategy. Either intuitively or with the aid of a systems requirements analysis technique, innovative options can be generated for the "use" of IT in supporting organizational effectiveness (alignment IT strategy) or in shaping it (impact IT strategy).

If certain IT uses turn out in practice to be better suited to some purposes than to others, this will be because some corresponding organizational design is better suited to some competitive strategy [Galbraith & Nathanson, 1978; Miller, 1986; 1987]. It would be part of the decision makers' strategy formulation task to investigate these possibilities, in respect of their own company and their competitors.

A. Organizational Impacts of IT

Accounts of the use of IT to improve organizational effectiveness have been appearing since the earliest days of the technology's use in business. Because of the abundance and variety of the stories, it is best in practice (although not necessarily in research) to approach them with some a priori concept that will help isolate key points of IT impact on the organizational design. The concept of "bounded rationality" [Bakopoulos & Treacy, 1985: 5], derived from Simon's [1976: 240-244] explanation of the "limits to rationality", is proposed in this Framework because it emphasizes the close association between company development and individual decision maker development (see Section 4.2.I. and Figure 4).

In this Framework, individual decision making (which can be taken to include task performance) is said to be rational if it is consistent with the decision maker's assumptions regarding company ends, norms and alternative means, and with the proper utilization of available information. Group decision making (including process performance) is said to be rational if it is consistent with the collective assumptions of the group and the collectively available information.

> "The need for an administrative theory resides in the fact that there are practical limits to human rationality, and that these limits are not static, but depend upon the organizational environment in which the individual's decision takes place. The task of administration is so to design this environment that the individual will approach as close as practicable to rationality (judged in terms of the organization's [ends]) in his decisions." [Simon, 1976: 240-241]

From this point of view, there are two general classes of use to which IT can be applied:

Enabling the gap to be narrowed between the individual decision maker's assumptions and the realities of organizational ends, norms and means.

Enabling the assumptions of different decision makers to be synthesized into useful, consistent sets of collective assumptions.

Four levels of application can be identified at which IT, by thus extending the bounds of individual and group rationality, can improve the fit between organizational design and competitive strategy, and hence between its own uses and purposes. These constitute the framework within which the organizational impacts of IT are identified, and they are described in the following Sections.

1. Personal Effectiveness

Because developing the company's distinctive competence depends crucially on developing individual decision makers' competence, uses of IT that widen the bounds of individual rationality can significantly further the purposes of IT in the competitive strategy. Such uses occur in the context of different generic tasks - e.g. managers, professionals, specialists, clerical workers, factory foremen - and through the medium of personal productivity tools - e.g. information access services, word processing, computer-aided design, personal databases, and spreadsheet systems.

The impact of IT on personal effectiveness can be measured in terms of the "value added" to labor or management resources [Strassman, 1985: Ch. 8]. But,

> "There is a limit to the amount of information one may extract from any productivity ratio ... That is why I have found productivity indexes, used alone, so unsatisfactory. The strategic aspects of information technology are best

explained in terms of their influences on business results, such as changes in market share, improved product quality, increased market penetration, higher profit margins, and enhanced customer service." [Strassman, 1985: 140]

The challenge to IT decision making at this level, therefore, is to devise a means of observing and measuring the relationship, if any, between increasing personal competence and improving company performance. At the very least, such measures will have the merit of calling into question investments in personal IT support that have no identifiable effect on overall company performance.

Certain technologies - e.g. local area networks, shared, departmental systems, integrated workstations - link individual tasks in the passage from personal to work-group effectiveness.

2. Work-group Effectiveness

By enabling better interaction among individuals, and hence better pooling of data and assumptions (regarding organizational ends, norms and alternatives), IT can extend the bounds of work-group rationality. It can create collective rationality where very little more than a collection of organizational isolates would otherwise exist. It is at this level of application that the behavioural sciences concerned with group processes should be brought into systems analysis (see, for example, Davis & Olson, [1985: 169-177]).

Applications of IT at this level further those purposes of competitive strategy that rely on the effective linking of tasks and processes, within and between organizations. They occur in the context of different generic roles - e.g. managers and their secretaries, members of permanent decision making groups and, in general, members of any set of interdependent tasks:

"The simplest type of inter-dependence is pooled. It simply means that two units share the same pool of

> resources such as money, managerial talent, or space. The second type is sequential inter-dependence, where there is movement of work between units, as in a fabricating and assembly operation. ... The third and most critical type of inter-dependence is reciprocal. An example of this is an assembly unit that feeds an inspection operation that in turn feeds back the pieces to the assembly unit."
> [Galbraith & Nathanson, 1978: 21-22]

Each level of group inter-dependence represents increasing costs of IT support, ranging from pooled (which could need nothing more complex than common access to a database), through sequential (which could be satisfied by an elementary data input and retrieval system, batch or online depending on the timeframe of the inter-dependence, but could also require electronic mail and other quasi-interactive services), to reciprocal (which could demand a real-time, interactive information and control system, with costly fail-safe features).

The impact of IT on work-group effectiveness can be measured in terms of "departmental value added" [Strassman, 1985: 143-145], but problems similar to those mentioned in the individual context will arise.

Zuboff [1982] raises fundamental issues of the "new worlds of computer-mediated work", induced by networks, workstations and shared databases at the work-group level. New organizational policies are needed to shape new employment relationships; new techniques of managerial control have to be developed; and shifts in basic beliefs about the nature of an organization and the role of management are changing corporate cultures.

> "What is an organization if people do not have to come face to face in order to accomplish their work? Does the organization itself become an abstraction? What happens to the shared purpose and commitment of members if their face-to-face interaction is reduced?" [Zuboff, 1982: 152]

Certain technologies - e.g. wide-area data communication networks, transaction processing systems, integrated database management systems - will link workgroups and their processes in the passage from work-group to business unit effectiveness.

3. The Business Unit

At this level, the purposes of competitive strategy are served by uses of IT that effectively configure tasks and processes into systematic wholes. These wholes may not be the same as the official organizational structures, but they are clearly related to the strategy in that they help individuals and groups make and carry out decisions that approach as close as feasible to rationality as defined in this Framework (Section 4.3.III.A.).

Technologies that support effectiveness at this level are those that link major structures and processes within and between organizations - e.g. integrated order entry systems linking customers and suppliers, office administration systems that link into company databases, integrated factory management systems, just-in-time delivery systems, computer-aided design and manufacturing systems linked to suppliers' inventory systems, shared airline reservation systems. These technologies can be used to support strategic business units as they already exist (alignment strategy) or to shape them (impact IT strategy).

It is generally agreed [Benson & Parker, 1986(2); Porter & Millar, 1985; Strassman, 1978: 140] that the business unit is the lowest organizational level at which the IT contribution to organizational effectiveness can satisfactorily be measured. This point is relevant in the definition and measurement of the competitive advantage gained through the use of IT (Section 4.3.IV.C.), and in the evaluation of the strategic costs, benefits and risks of particular IT implementations (Section 4.5.III.A.).

From another point of view, that of organizational development and learning, the use of IT at business unit level can extend the bounds of rationality by generating good dialectic.

Firstly, because of the considerable range and flexibility of technological options at this level of aggregation, significant contradictions can arise between business unit needs as perceived by owners and developers within a business unit, and corporate needs as seen by owners and developers with a company-wide perspective. For example, business unit purposes may be best served by a self-contained, highly integrated software package with specialized data and program structures - such as the Millenium software for financial accounting and administration, the Hogan software for commercial banking, the PRISM software for financial asset management, or any of a variety of materials requirements and planning packages. Corporate requirements, on the other hand, might best be served by common management information formats and data recording standards.

Secondly, optimally satisfying a business unit's IT demands can result in significant additional cost to the corporation as a whole and to the other business units, who may have to bear higher cost allocations for software, equipment, network services, machine capacity and technical support that might otherwise have been shared.

Thirdly, applications of IT at this level have the capacity to reconfigure the underlying generic work processes and jobs, to the extent of challenging the effectiveness of the official delegation and reporting structures.

It must be expected, therefore, that conflicts between corporate management and business unit management and between one business unit management and the others, and contradictions between generic and official organization structures, will arise in formulating a company-wide IT strategy. In good organizational dialectic, these should be recognized as natural and important developmental opportunities for the company. In practice, unless organizational change is the explicit objective of the project, it is unlikely that a major re-structuring of the company or its policies will follow on an IT application. Chandler [1962: 314-323] theorizes that corporations rarely reform themselves until mounting inefficiency forces them to do so, and describes how organizational innovators are likely to be persons quite different in temperament and approach from business strategists.

In the terminology of the present Framework, the situation would be that of attempting to impose an impact IT strategy onto a competitive mode business strategy. Introducing the concept of bounded rationality into organizational IT learning addresses this situation by attempting to transform the mode of thinking in the business domain from competitive to entrepreneurial, thus permitting the IT architects to design a target environment in which the time lag between implementation of IT strategy and restructuring of the organization can be reduced considerably.

Inter-divisional systems mark the passage from business unit effectiveness to company-wide effectiveness, and point more clearly than any other single factor to the need for a consistent, company-wide IT infrastructure.

4. The Company

Sullivan [1982] suggests six dimensions along which systems architecture can contribute to the internal capability of a company. The concept of bounded rationality can be expanded in terms of these six dimensions in order to identify impacts on the generic structures and processes of the company, which transcend current business unit and other organizational definitions.

> Horizontal Dimension: Integrating business functions - e.g. accounting, marketing, manufacturing - to achieve more comprehensive functions that are more cost effective or provide better vehicles for strategic moves.

<u>Longitudinal</u> <u>Dimension</u>: Integrating systems in one business unit with those in another, to exploit synergies.

<u>Vertical</u> <u>Dimension</u>: Integrating internal levels of control, e.g. strategic, tactical, operational.

<u>Physical</u> <u>Dimension</u>: Integrating systems across geographical locations; integrating different kinds of IT.

<u>Temporal</u> <u>Dimension</u>: Ensuring that IT purposes as originally formulated remain congruent with IT uses as eventually implemented, over many business cycles.

<u>Gateway</u> <u>Dimension</u>: Providing the inter-organizational systems needed by the business strategy.

In single-loop learning, the bounds of individual and group rationality can be widened by integrating systems along any of these dimensions, but only to the extent that existing business unit definitions are not upset. It may require double-loop or even second-order learning at the highest management levels in the company, if business units are to be redefined.

There is another, more fundamental, way in which the use of IT can extend the bounds of rationality at company level. Extending the strategic scope of a company (by innovation, growth or alliance) can be viewed as the substitution of internal decision making processes for external market operations [Williamson, 1975: Ch. 2]. In effect, the uncertainties of the market place are replaced by relatively more predictable organizational relationships and processes.

The circumstances under which this substitution will be made depend on the nature of the company's transactions, and the costs of completing them, rather than on technology <u>per</u> <u>se</u> [Williamson [1975: 1-2]. IT, however, is different from other technologies precisely in that it is a transaction processing technology. It will, therefore, be a major factor in any transaction-oriented analysis of the company's scope and of its relationships with other organizations Williamson's [1975] theory of "markets and hierarchies" can provide the theoretical foundations of a business case for inter-organizational systems, complementing the use of Porter's [1980; 1985] theories of strategic forces, generic strategies and the value chain.

The principal technologies that support corporate effectiveness at the company level are those related to transaction flow - data communication networks, and company-wide and inter-company transaction processing systems and databases. Where the rate of transaction flow is high, the performance levels of the technologies, e.g. computer processing power, data storage access speeds, telecommunication bandwidth, become crucial factors.

B. Organizational Uses of IT

1. Strategic Business Systems

Simon [1976: 39-41] identifies three bounds to decision makers' ability to make correct decisions and to carry out tasks. In order to characterize strategic uses of IT, these three bounds can be summarized in traditional terms as follows:

> Knowledge: The knowledge and information available to decision makers in performing tasks and making decisions.
>
> Skills: The unconscious skills, habits and reflexes, that limit decision makers' ability to perform a task.
>
> Attitudes: The values and conceptions of purpose that influence the way in which tasks are performed and judgements are made, which may diverge from the ideals, objectives and goals of the organization.

According to Simon, it is only within these three bounds that decision making can be regarded as rational. It is also clear from the levels of organizational impact discussed in Section 4.3.III.A. that good, i.e. rational, organizational dialectic (Figure 4) will depend on the knowledge, skills and attitudes brought to strategic decision making at each organizational level - individual, workgroup, business unit and company - and in all four domains - owners, developers, users and operators.

Hence, in terms of the present Framework, the organizational design task must be to build structures, processes and IT applications that extend the bounds of individual and group rationality at all organizational levels, in all domains, judged in terms of the strategic purposes established for IT. A strategic use of IT is defined in this Framework as one that supports this organizational design task.

In their discussion of a company's "internal strategy" (i.e. organizational design), Bakopoulos & Treacy [1985: 4] highlight the duality of the organizational design problem:

> Structures: The alternative organizational forms, at corporate, business unit and work-group levels, into which tasks, authorities and responsibilities are structured as best fits strategic objectives.
>
> Processes: The alternative organizational processes - the work, resource and information flows - for getting the tasks done.

The distinction must be made between, on the one hand, generic organizational processes and the de facto organizational structures (configurations of work) they induce, and, on the other hand, the formal management structures shown in the official organization charts. Generic structures and processes correspond to the concept of "primary function" in EwIM, and are generic in the sense that they define company likeness by industry class and function [Benson & Parker, 1985: 16]. They rest on a systems theoretic view of organizations and reflect the actual inter-dependencies among individuals and work-groups through which the company is able to produce and deliver its products and services.

The lag between competitive strategy implementation and organizational restructuring observed by Chandler (Section 4.3.III.A.3.) can be investigated dialectically as a contradiction between persistent older organizational forms and emerging new generic structures and processes, which awaits synthesis by organization innovators. To ensure that this issue does enter the organizational dialectic explicitly and timeously, and is not left to chance, the Framework defines a "unit of discourse" for the use of IT in organizational design. This is the "strategic business system":

> A set of closely interrelated generic organizational structures and processes, i.e. a human system,
>
> Supported by one or more generic IT applications, i.e. an information system,
>
> That extends the bounds of rationality of its owners, developers, users and operators,
>
> In order to achieve, directly or indirectly, well-defined and measurable purposes in the competitive strategy.

An information system may be freestanding, e.g. a payroll system. It may be an element of some larger application, e.g. an inventory control system within a factory management system. It may be a service imbedded in the IT infrastructure itself, e.g. the data access security system. Similarly, a human system may be self-contained within an official branch or department of the company, e.g. stock control. It may be co-extensive with such a department or branch, e.g. factory management. It may span several departments and branches, either as a recognized element of the corporate infrastructure, e.g. personnel administration, or as a web of sub-processes permeating many areas of functional and divisional responsibility, e.g. the cash management process.

Organizational designers require a rationale or logical framework through which the abstract concept of a strategic business system can be made concrete and relevant in terms of the generic structures and processes of their particular company. Many such frameworks are available in the literature. The two proposed in the Structure Component of this Framework (Section 4.4) are:

> Porter's [1985] theory of the business unit as a chain of value-creating activities and linkages, because it permits the concept of a strategic business system to be linked directly and measurably to the purposes of IT, through a precise definition of "competitive advantage".
>
> Ives & Learmonth's [1984] model of the customer resource life cycle, which can be used to generate many implementable opportunities for strategic business systems in the relationships between a company and its customers.

2. Classes of Use

Since strategic business systems involve uses of IT that extend the bounds of rationality, three major classes of such systems can be identified:

> <u>Automation of Activities</u>: These are systems that expand or substitute for human capability, usually at the level of task performance, i.e. the operational and operational control levels of the company [Anthony, 1965: 19; Blumenthal, 1969: 29].
>
> <u>Organizational Process Control</u>: These are systems that support or enforce congruency between the ends (ideals, objectives, goals) of individuals and work-groups and those

of their own or some other organization. Until the late 1970s, these were management control systems aimed at co-ordinating the budgets, resource allocations, standards, quality control and so forth of consenting participants within the organization. In the "competitive weapon" systems, the effect if not the stated intention is to control persons, processes and organizations outside the company (Section 4.2.II.B.), and consent is not always respected.

Information Services: These are decision support systems, management information systems, data retrieval systems and so forth, which expand or substitute for human decision making competence at any organizational level, by gathering, processing, correlating and presenting appropriate knowledge and information.

In each of the above classes, the applications represent conventional uses of IT in every sense. They combine appropriate technologies according to generally accepted systems engineering principles, and provide the basic data processing functions of capture, conversion, transmission, transformation, generation, association, retrieval and presentation. The information system part of a strategic business system is not materially different in design or use from any other application. The difference lies in its purpose and hence the management attitude towards it, a fact confirmed in a Butler Cox Foundation Survey:

"Of the respondents, 68 per cent indicated that they do regard competitive-edge applications as different. Several respondents provided reasons for their view, and these can be summarized as just two basic differences:

- ... the basis on which the decision to proceed is made. The emphasis is on comparing opportunities and risks rather than on comparing costs and benefits. ...

- Different attitudes and approaches to systems development ... Speed of implementation, reliability, and the quality of the user interface rank more highly than efficiency and technical elegance." [Butler Cox Foundation, 1987: 4]

These respondents emphasized that, from a technical point of view, the competitive-edge applications are similar or identical to traditional applications. The other 32 per cent indicated that, in their view, competitive-edge applications do not constitute a separate class of system because, in their organizations, all factors - competitiveness, efficiency and effectiveness - were taken into account in systems planning.

Elements of each of the three classes - automation, control, information - will be apparent in virtually any strategic business system, but one of them will tend to be the dominant theme.

For example, systems in which automation is the dominant theme would be designed and used to process defined transactions, to produce fixed-format management reports on schedule, or to establish intra- and inter-organizational links. Machine processes are substituted for human processes.

In alignment IT strategy the purpose would be organizational effectiveness though product or service improvements or cost reductions, possibly in ways that would not be feasible without IT - e.g. rapid order processing and customer billing. In impact IT strategy, the purpose and acceptable scale of the investment would be different, e.g. a turnaround on order processing and customer billing that is so rapid that it raises the level of competitor rivalry or creates a barrier against new entrants.

Systems in which organizational process control is the dominant theme would be designed to ensure that organizational processes continue to operate within the desired bounds. Machine processes control human activities.

In alignment IT strategy the applications are aimed at optimizing and co-ordinating the linkages between processes within the company, e.g. integrated manufacturing systems, integrated corporate planning systems. In impact IT strategy the system might be inter-organizational, aimed at manipulating the linkages between the company and its strategic targets, e.g. just-in-time systems imposed on suppliers, airline reservations systems outflanking competitors, order-entry systems infiltrated into customer organizations. On the surface, these systems appear to be aimed at automation or information services but, as the Frontier Airline case shows (Section 4.2.II.B.), the true purpose is undeniably control of the strategic targets.

Systems in which information service is the dominant theme would be designed to satisfy the information needs of managers and employees, e.g. by providing data gathering, collation and retrieval facilities, end-user programming, graphics, "what-if" modelling programs, and so forth. Machine processes are applied in support of human effectiveness.

In alignment IT strategy, the aim is managerial effectiveness though better planning, management controls, decision making and so forth, almost always in ways that would not be feasible without IT, e.g. to reduce budget preparation time from months to weeks or even days. In impact IT strategy, the application might focus on obtaining and using privileged information about the strategic targets, or on changing the production economics and/or user acceptability of the product by increasing its "information intensity" [Porter & Millar, 1985: 153].

In this Framework, the concepts of level and class of use define the operational dimensions of the use of IT in organizational design. They are shown as the fourth and fifth steps in Figure 11. The five steps taken together force decision makers to link purpose and use in their strategic thinking, and the unifying concept for design and implementation is that of a strategic business system.

IV. IT POSITIONING

"IT positioning" is the quadrant of IT Strategy shown in Box B of Figure 8:

> "Before the top team can create a strategy using IT effectively, it has to have a clear understanding both of the technologies available now and in the foreseeable future and of the likely impact of each of those technologies on the organization's competitive position. ... The process of gaining this understanding has attracted the name IT positioning." [Jarvis, 1985: 21]

The analyses carried out in terms of Boxes A and C of Figure 8 (Sections 4.3.II. and III.) allow IT decision makers to formulate the purposes and uses of IT as a number of possibilities or potentialities. In accordance with the contingency principle (Section 4.1.III.D.3.), Box B is intended to help in formulating constraints on appropriate purposes and uses, i.e. which of the possibilities are feasible and desirable. The outcome of this third major step in determining the role of IT in the business strategy is an "IT Positioning Statement", which will serve as the fundamental guideline in developing and implementing the architecture of the target environment.

A. IT Strategy Evaluation

It is clear from the discussion of Figure 9 in Section 4.3.I. that IT strategy is not of equal importance in all companies.

> "For some organizations, IS activities represent an area of great strategic importance while for other organizations they play, and appropriately will continue to play, a cost-effective and useful role but one which is distinctly

> supportive in nature. Organizations of this latter type should expect that a lesser amount of senior management strategic thinking would be devoted to their IS organization." [Cash, McFarlan & McKenney , 1983: 26]

The adaptation of McFarlan's "information systems strategic grid" [Cash, McFarlan & McKenney, 1983: 216-218], shown as the "IT strategy evaluation grid" in Figure 12, provides a means of determining what a business unit's IT positioning ought to be. If the company consists of several business units, a separate analysis is necessary for each. In broad terms, the grid helps decision makers address the following questions:

> What changes in IT strategy and organizational design are necessary if the current IT positioning is not consistent with the current competitive strategy?
>
> What changes in IT strategy and organizational design are necessary to move the company from its current competitive strategy to another?

Either case can be interpreted as a move from one of the Boxes of Figure 12 to another, and a strategic IT decision making problem is to identify and provide for the implications of such a move. If the company consists of several business units, they may not all be moving in the same way, and this too has to be taken into consideration in company-wide IT strategy.

By analogy with the product/business life cycle and the Boston Consulting Group growth/share matrix [Robinson, 1986: Chs. 5-8; 11-13], and with a view to tuning the IT strategy evaluation grid as a diagnostic and prescriptive tool geared to the company's own stage of development (Section 4.6.III.A.), various "sequences" of IT positioning moves can be considered. For example:

> <u>First</u> <u>Stage</u>: The business unit is in the Turnaround Box - it may already enjoy effective IT support for its

organizational processes, but its competitive strategy has not hitherto been critically dependent on it. The data analysis and dialectical enquiry of the Context Component indicate that the situation is now changing, and there is much emphasis on new systems development. By definition, this entails new purposes and uses for IT, so IT strategy will almost certainly be impact. Much strategic planning is needed, and this will be difficult if managers lack experience in strategic IT decision making.

Business Life Cycle Phase: "Introduction".
Boston Consulting Group Matrix: "Question Mark".

Second Stage: By the time the business unit reaches the Strategic Box, the strategic business systems identified in the previous stage have become existing systems, but the need for further new applications in the competitive strategy is still growing. Hence the business unit is now critically dependent both on the smooth running of existing systems and on rapid and reliable development of new applications. Much strategic IT planning effort is needed, aimed at being both "right" and "first" - e.g. to preempt competitors, or to gain lasting unit cost advantage by being first down the experience curve [Robinson, 1986: Ch.9]). If the emphasis on new systems development implies new purposes and uses for IT, and hence new competitive strategies and (eventually) new organizational designs, the IT strategy will be impact.

Business Life Cycle Phase: "Growth".
Boston Consulting Group Matrix: "Star".

Third Stage: When the business unit is in the Factory Box, it will have exhausted the range of feasible purposes for IT in the current product/market segments, at the current stage of the technological life cycle, and the demand for new systems tapers off. While the business unit remains heavily dependent on the existing systems, there is little indication of basic changes in its competitive strategy and organizational design, and hence of new purposes and uses for IT. An alignment IT strategy is indicated, focusing on better support for existing processes, good systems maintenance, and operational efficiency.

Business Life Cycle Phase: "Maturity".
Boston Consulting Group Matrix: "Cash Cow".

Fourth Stage: Finally, as the product and/or its market decline, so too does the competitive impact of IT in this context. The business unit enters the Support Box, where IT issues are not critical to the business strategies. The IT budgets, however, can grow quite rapidly if users and operators start buying into new technologies - e.g. personal computers, laser printers, graph plotters - on a scale that is not justified by any strategic purpose of the owners or the developers. Unless the desired impact of IT is to inject new life into old products, thereby starting a new cycle, IT strategy is appropriately alignment and a strategic task is to ensure that it remains so.

Business Life Cycle Phase: "Decline".
Boston Consulting Group Matrix: "Dog".

This sequence of IT positionings is only one of several possibilities. A sequence that is appropriate for a given company has to be determined, for example through dialectical debate, and tested empirically, for example through market research. Such an exercise has diagnostic and prescriptive value for the planning of transition stages in IT strategy implementation (Sections 4.5.II. and 4.6.III.A.). It could also reveal new purposes for IT, e.g. to change the shapes of the product and business life cycle curves [Robinson, 1986: 74-83].

B. Investment Focus

If evaluation shows that an upward movement in the scale and importance of the IT strategy is needed, two further questions immediately arise:

> What will the overall cost be in terms of time, money and other resources, and can the company afford it?
>
> Where should the investment focus be - i.e. what are the development priorities?

In traditional systems requirements analysis, such questions have been asked only after one or more development projects have been identified. When, however, an IT strategy is based on the principles of interactive planning and idealized design (Section 4.2.III.A.), the questions have to be asked in advance, and the approximate bounds of acceptable answers must be stated as policy guidelines for strategic IT planning. For example, what are the upper limits to available capital? What is the acceptable ratio of IT running costs to sales revenue and/or total operating expenses? What broad priority areas for development are implied by the identified purposes and uses of IT?

A wide range of issues will arise in attempting to answer such questions. Once again both facts and assumptions will be relevant, and Tichy's [1983] "T,P,C (Technical, Political, Cultural) Theory" for change management provides a useful framework for organizing the issues:

> The Technical Design Problem: The investment focus agreed on should reflect a proper allocation of scarce IT resources to those strategic business systems that will, in the aggregate, contribute to maximizing the competitive advantage gained through IT, over the payback period agreed on. It is largely to this strand of the problem that the Structure and Process components of this Framework are

addressed. There are, however, two other strands that must also be managed.

<u>The Political Allocation Problem</u>: If there is more than one business unit in the company, corporate management have to agree on a basis for distributing IT resources at this level. The problem is political because, at least in South Africa, IT human, financial and technological resources are scarce and problematical. If their availability to the company as a whole is well below what the business units in sum total believe they can afford to employ, mechanistic allocation criteria will not convince one business unit that its claims are inferior to those of another.

As discussed in Section 4.3.III.B., the structures and processes of strategic business systems often lie beneath the official organization forms. It is in terms of the latter, however, that management competence and accountability, and "functional area policy options" [Hofer & Schendel, 1978: 23-24], are commonly understood. Hence a further political problem arises out of the potential for mismatch between an IT investment focus that is best for the success of the business strategy, and one that is best for the success of the decision makers.

<u>The Cultural/Ideological Mix Problem</u>: Deciding on the company's competitive strategy and whether and to what extent the organizational design should be adapted are greatly influenced by the decision makers' personal values. Consequently, the decision on how much resource to invest in which projects can be influenced as much by "soft" cultural and ideological factors as by "hard" technical and financial analysis.

Many managers find it difficult, for example, to justify IT expenditures in any terms other than cost savings. They may hold espoused theories about the other kinds of generic strategy, i.e. differentiation and scope, but when it comes to making a decision their theories in use revolve around cost displacement. For example, IBM Canada's [1983, 1986] "Executive Planning for Data Processing" translates the evaluation of IT costs and benefits into the terminology of "effective headcount".

More general political and cultural problems are discussed in Section 4.3.V.B., while another application of Tichy's framework is described in Section 4.4.V.A.

C. <u>Competitive Advantage</u>

In this Framework, human systems design and information systems design are tightly coupled in the concept of a strategic business system. The Porter value chain is the proposed basis for systems analysis (Section 4.3.III.B.1) because it permits the success of an IT strategy - viewed as the creation and deployment of strategic business systems - to be measured in terms of the competitive advantage aimed at and achieved. Thus the third important "constraint" to be taken into account in IT positioning is the measurable competitive advantage the company hopes to gain from its strategic business systems. Estimating this competitive advantage constitutes the final step of the Strategic Option Generator (Figure 11).

Hofer & Schendel [1978: 25] define "competitive advantage" as the unique positions a company develops vis-à-vis its competitors through its pattern of resource and skill deployments and/or its present and planned interactions with its environment. They define "synergy" as the joint effects the company seeks between its resource deployments on the one hand and its environmental interactions on the other. These definitions suggest an approach to measuring competitive advantage that will be consistent with the dialectical activities and organizational congruencies of the present Framework, as depicted in Figure 4 (Section 4.2.I.).

The approach is outlined in Figure 13:

Interactions with the Environment: The net effect of the company's past, present and intended interactions with its environment, which includes product and market scope as well as interactions with the strategic targets, is its "competitive position".

An evaluation of a company's competitive position would refer to its overall performance goals (e.g. total turnover, profit margin, return on investment, earnings per share) and to key success factors relative to the competition (e.g. market share, breadth of product line, sales distribution effectiveness, capacity and productivity).

Resource and Skill Deployment: The net effect of the company's past, present and planned deployments of its skills to achieve its competitive position is its "organizational effectiveness".

An evaluation of a company's organizational effectiveness would refer to the quality of operating and technical performance it achieves through its pattern of skill and resource deployments. Measures such as turnaround time on orders, reduction in clerical error rates and transactions handled per workgroup per day quite common. More generally, Ansoff [1968: 84-93] describes how the relatively informal "strengths and weaknesses" analysis of the Context Component can be made more rigorous as a "grid of competences", according to major functional areas and generic classes of capability.

Synergy: The joint effects of the company's competitive position and organizational effectiveness, and of collaborative efforts among different workgroups and business units of the organization, may be called "synergy".

An evaluation of synergy would refer to the aggregate sales revenue, operating expense and return on capital employed obtained from all the company's products, and how these results would change when the several production processes are inter-related in different ways [Ackoff, 1968: 72-74].

Many other factors than IT come into play in determining the overall company results pertaining to competitive position, organizational effectiveness and synergy, and it would be extremely difficult in practice to sift out the measurable IT contribution to each. By descending each of the columns depicted in Figure 13, however, it should be possible to trace a sequence of cause-effect relationships in such a way that IT-specific measures can be arrived at, which refer to strategic IT purposes, organizational IT uses, and the congruency between them.

Competitive Strategy - IT Purposes: For example, it may be decided that a certain IT application will improve the company's competitive position:

If it allowed the sales team to increase market share by a given percentage,

Or if it allowed the engineering function to lower the capital intensity of a production process enough to raise the return on capital employed by a given amount over the industry average,

Or if it allowed production management to change short-run cost curves in a way that enabled the company to increase net profit over a given period by a better percentage than the competition.

The measure of IT contribution to competitive position is not taken in terms of the actual increase in market share, return on capital or profit margin realized. It is taken rather in terms of whether and to what extent the necessary preconditions for attaining these results were created, i.e. the observable changes in the quality of the sales support, or of the production process, or of cost management, that can be attributed to the IT application.

Hofer & Schendel [1978: 75-79; 106-107] describe a five-step process for identifying and scoring the measurable key success factors for competitive position. If IT-based preconditions are attached to each key success factor, the process can be adapted to the evaluation of competitive position through IT, intended vs. attained.

Organizational Effectiveness - IT Uses: Hofer & Schendel [1978: 152] make the point that not all organizations have resource and skill deployments so unique that they could be called distinctive competences. For most companies, organizational competences need to be carefully identified in functional terms, so that they may be measured as precisely as possible. Using Porter's value chain to analyze strategic business systems in terms of generic functions or "value activities" (Section 4.3.III.B.1.) allows this to be done. By definition, a business unit achieves measurable competitive advantage - i.e. becomes organizationally effective - when it performs the chain of value-creating functions that go into producing its product or service, either at a lower cost than competitors can or in a way that justifies a premium price.

Once again, the measure of the IT contribution to organizational effectiveness is not taken directly in terms of the improvements obtained in functional and inter-functional performance. It is taken rather in terms of whether and to what extent the preconditions for functional effectiveness have been achieved by the application of IT. For example, the observable improvements in task performance, in inter-departmental workflow and in managerial decision making that can be attributed to the IT application.

Part of the analysis will involve determining precisely how the preconditions for organizational effectiveness differ, if at all, from those for competitive position, what the logical relationships between them are, and what the implications may be for selecting and managing IT application projects.

Synergy - Congruency: Following Ansoff [1968: 75-84], four different kinds of synergy can be identified. With reference to the purposes and uses of IT, these can be described as follows:

Sales Synergy: This can occur when different products or services use the same IT infrastructure and/or business systems in distribution channels, sales administration, warehousing and so forth. The synergistic effects arise out of the putting together of organizational processes that would otherwise have remained separate, and are reflected in decreased development or operating costs, decreased IT and other capital investment, or increased turnover made possible by the additional customer bases opened up to each product. A company with just one product can also achieve these effects through participation in inter-organizational systems.

Operating Synergy: Lower operating costs can be achieved through fuller utilization of IT skills and other resources, spreading of overheads, common learning curve effects, and volume purchase discounts.

Investment Synergy: Sharing common IT infrastructure and business systems can lead to fuller utilization of capital employed; it can also bring IT facilities within the reach of business units who might not be able to afford them on their own.

<u>Management</u> <u>and</u> <u>Expertise</u> <u>Synergy</u>: Management experience and technical skills gained in applying IT in one business area can give the company a head start in another business area.

The above are all positive synergistic effects, which make congruency between IT purposes and IT uses much more than merely the neutral issue of good fit. There are, however, also negative synergistic effects. For example, two business units may agree to a joint development of an information system because their two products appear to be so similar. In the course of detailed analysis, it may become clear that their administrative and operating requirements (the human systems parts) are so different that the effort and expense involved in building a joint system to satisfy both far exceed the cost of separate development.

Even when there is no sharing of infrastructure and business systems, synergistic effects are still possible. For example, there are usually several ways in which IT infrastructure and information systems can be designed to support a given product. Some of these ways may provide a better fit than others with the human systems part, in the sense that they could stimulate higher sales revenue, or lead to lower operating costs, or require lower capital investment. Such effects could arise out of insightful design of the infrastructure and the information systems to meet the requirements of the human systems. In such cases, congruence is achieved through an alignment IT strategy. Better insight into what is needed to serve the purposes of the competitive strategy could, however, lead to bolder and more skillful (re)design of the entire business system - the information systems part as well as the human systems part. In this case, a higher order of congruence is achieved through an impact IT strategy.

The above characterization of competitive advantage has a number of important implications for the IT Positioning Statement:

> Firstly, by definition it is best to define competitive advantage through IT in the aggregate for a given product or product line, or even perhaps for the whole company, depending on the synergy between business units. It can never be satisfactory to consider the ROI of one project or business system among many [cf. McFarlan, 1984: 101-103].
>
> Secondly, the payoff expected from the aggregate strategic investment in IT should refer to the improved attainability of the "ultimate" measures (business goals and key success factors) relative to the competition, rather than to their actual attainment.
>
> Thirdly, specific advantages - in competitive position, in organizational effectiveness and in synergy - will differ from one business unit to another. The implications of these differences for the IT strategy evaluation (Section 4.3.IV.A.) and the IT investment focus (Section 4.3.IV.B.) should be made clear in the positioning statement.

This characterization of measurable competitive advantage thus provides the definition of "benefits" for the calculation of the aggregate strategic costs, benefits and risks of IT strategy, as discussed in Section 4.5.III.A. Measures relating to competence in IT decision making constitute a special subset of the factors that will emerge as analysis proceeds down the right-hand column of Figure 13. These are the "decision making success criteria" dealt with in Section 4.4.V.D.2.

D. <u>Appropriate Technology</u>

A reasonably accurate picture of the information technologies that will be strategically important to the company will have been developed in the Corporate IT Scenario. These include not only emerging new technologies but also the emerging capability of existing technologies - for example, computer processing power; processor memory design, capacity and throughput rates; data communications capacity and functionality; and data storage design, capacity and channel speeds.

Particular technologies and capabilities that are deemed relevant to the present and possible future competitive strategies of the company need to be identified in the Positioning Statement. It is useful to consider three levels of strategic relevance:

> General Relevance: Technologies that are critical to any company in the Turnaround or Strategic Box of the Strategy Evaluation Grid.
>
> Particular Relevance: Technologies that are critical to this industry or to this company.
>
> Special Relevance: Technologies that assume special significance in the South African setting.

It is not only new or advanced technologies that are strategic. The innovative use of existing technologies in new applications, or of existing applications in new strategic situations, can be as impactive as state-of-the-art technologies, and will often involve less risk.

> "There is considerable evidence, both from our research and that of others, that in most cases competitive-edge applications evolve though the incremental extension of in-house systems; and that they are identified and pursued by line management without (in many cases) much help from the systems department." [Butler Cox Foundation, 1987: 1]

It must also be remembered that a technology is counterproductive when it reinforces an undesirable status quo in organizational processes - for example, when an online bar-coding system is used to keep track of the flow of vast quantities of paper documents.

Whether IT remains "a" or becomes "a crucial" or even "the" technology of the business will depend on the changes it brings about in company mission, competitive strategy and organizational design. The permissible scope and limits of these changes will determine whether alignment IT strategies or impact IT strategies are to be followed, and the consistency of these judgements will be cross-checked in the IT strategy evaluation.

Timing is another critical factor in IT positioning. At what points in the life cycle of a technology will the company generally wish to enter - e.g. "cutting edge", "state of the art", "advanced", "mainstream", "mature" or "decline"? [Buskirk, 1986: 8]. In what sequence should the technologies be introduced into the organization, bearing in mind that development resources are limited? How far in advance can the IT needs of specific competitive strategies (e.g. responses to the market; launches of new products and services; new market entries; specific campaigns) be reliably foreseen, and how far ahead can the appropriate technology entry points be predicted? What will the acceptable trade-off be between development lead-time and technical efficiency?

The Arthur Andersen Delphi study conducted for LOMA [Life Office Management Association, 1984: 16] identified three stances companies could take with regard to IT innovation.

> Pioneers: These were the companies who made greater initial investments, thereby gaining a decided competitive edge, but at some business risk.
>
> Move With the Pack: These companies followed the leaders; they increased productivity and perhaps improved their competitive position. This was seen as the least-risk strategy and was favoured by "emerging leaders and technology executives".

<u>Trailers</u>: By delaying the implementation of new technologies, these companies compromised their competitive position in all regards except business risk avoidance.

Pioneers exhibit the entrepreneurial mode (Section 4.3.II.B.2.) and are thus candidates for impact IT strategy. The other two stances exhibit the competitive mode, and their IT strategies, if any, are typically alignment.

V. <u>IT STRATEGY</u>

If the match a company makes between the opportunities and risks of its external environment and its internal skills and resources can be called a strategy, then all companies can be said to have a business strategy [cf. Hofer & Schendel, 1978: 4].

In the same way, if the match a company makes between the issues of Boxes A, B and C of Figure 8 can be called a strategy, then all companies can be said to have an IT strategy. This match may or may not have been planned, and it may or may not be good, but it can always be investigated and described. If IT is important in the business strategy, which it certainly is if the company is positioned in the TURNAROUND or STRATEGIC Box of Figure 12, then the IT strategy should be formally planned and explicitly communicated to all concerned.

Following Hofer & Schendel [1978: 5-7], the reasons for making the IT strategy formal may be summarized as follows:

To assist in drawing up and communicating corporate and business unit objectives and goals for IT.

To assist in identifying and managing the major strategic issues associated with IT.

To assist in determining and evaluating appropriate IT investment projects (bearing in mind the limitations of traditional capital budgeting and risk/return evaluation techniques in IT planning).

To assist in making the correct allocations of the necessary human, financial and technological resources.

To assist in co-ordinating and expediting the many administrative, operating and technical activities involved in implementing IT strategy.

To assist in developing the competence of strategic IT decision makers.

IT strategy is always corporate or company-wide. This is trivially true when the company has just one business unit, but it is true also when there are several. In the first place, since IT strategy involves the allocation of scarce human, financial and technological resources to business units, it follows from generally accepted principles of business portfolio planning [Hofer & Schendel, 1978: 70; Porter, 1987: 53-57; Sloan, 1972: Ch. 7] that at least in this respect it is a matter for decision making at corporate management level.

Secondly, all business units share the responsibility for finding out what synergistic effects are available to the company as a whole. Whether these exist, and what to do about them, will involve joint decision making by corporate management and the several business unit managements. If there are indeed synergistic effects to be pursued (possibly no more than a saving in aggregate capital investment and/or running costs), all business units will become involved in defining and implementing a common IT infrastructure.

The very essence of business strategy is, as Bower [1982(1): 32] points out, effective problem solving, and many tools and techniques are available for specific problems in IT strategy (Section 4.1.IV.). Following Bower's [1982(1): 43] schema of the strategic planning process, strategic IT problem solving and decision making activities and the tools they require can be separated into two broad classes. The first concerns strategy formulation and the second, strategy implementation:

> IT Technology Strategy: This is the formulation of appropriate purposes and uses for IT subject to the constraints of the company's IT positioning - i.e. the business vision for the role of IT, and the development of the infrastructure, systems and decision making competence needed to realize the vision.
>
> It follows from the principles of interactive planning and idealized design (Section 4.1.III.A.) that the strategy will be expressed in the form of an architecture for an ideal "target environment"; and from the principles of continuity and contingency (Section 4.1.III.C. and D.3.) that the target environment will be designed for incremental implementation over time.
>
> IT Management Strategy: This is the overall administration and logistics plan for implementing the IT technology strategy. Essentially, it is a process for managing the transition from the present IT environment to the future target environment. It consists of a series of strategic thrusts and action plans aimed at building, incrementally, selected segments of the target environment, and it also covers the issues of acquiring and allocating the needed human, financial and technological resources, development priorities and project definition, co-ordination and control. The process can extend over several years, and could involve building decision making structures and processes that do not already exist in the company.

The IT technology strategy is dealt with in systems architectural terms in the Structure Component (Section 4.4), and the IT management strategy in organizational development (OD) terms in the Process Component (Section 4.5). The IT Positioning Statement produced by the Content Component should, however, indicate the scale, scope and significance of the IT strategy corporate and business unit management expect.

oooOooo

4.4 DECISION STRUCTURE

I. THE TARGET ENVIRONMENT

The target environment is the shared management vision of a company-wide internal environment in which IT is optimally applied in the business strategy, expressed in consistent, constructive terms that lead to implementation.

The Structure Component provides a framework - shown in Figure 14 - to help IT decision makers formulate an IT technology strategy in the form of a Target Environment Architecture that gives effect to the purposes and uses of IT determined in the Content Component.

Figure 14 is based on Figures 1, 2 and 3 of this Framework, Benjamin's "Three Steps in Strategic Planning" [Benjamin, Seminar E-01: Plate 4], and Nolan, Norton & Company's "Levels of Computer Architecture" [Advanced Systems Inc., Course 5055: 6].

As shown in Figure 14, the Target Environment Architecture can be presented from three perspectives:

> Dimensions: The four dimensions of the target environment introduced in Section 4.1.II.3. - IT infrastructure, human systems, information systems and human resources.
>
> Views: In each dimension, there is an external view that is communicable to all strategic IT decision makers, and an internal view for the developers of that dimension.
>
> Levels of Discourse: The four levels described in Section 4.1.III.D.3. - conceptual, meta-architectural, macro-architectural and micro-architectural.

Except for brief indications of the nature of the internal view in each dimension, this Study is limited to the external views.

Since the Study is also limited to the conceptual level of discourse (Section 4.1.III.D.4.), the following general description of what would be involved in the other three levels is provided:

> Meta-Architecture: This is the architecture of the ideal target environment, specific to the company in question, set well beyond the medium-term planning timeframe. Each of the four dimensions of the target environment is described in terms of generic constructs. The principal types of generic construct are:
>
> > Activities: Tasks that will be performed by individuals, groups, and machines.
> >
> > Structures: Organizational and technological forms into which tasks, workgroups and resources will be structured.
> >
> > Processes: Organizational and technological methods and sequences of actions, through which work, resources and information will flow as tasks are carried out.
> >
> > Policies: General rules that indicate which structures should be used and which methods and courses of action followed in different circumstances.
> >
> > Criteria: Standards according to which the quality of structures and processes and the success of activities and policies can be assessed.

Macro-Architecture: This is the more detailed architecture of one or more decision packets (Section 4.1.II.C.), which will be implemented in the medium term planning timeframe (3 to 5 years). The macro-architecture is expressed in terms of specific constructs. It is at this level that resources are committed to definite, realistic objectives, and the shared business vision for IT is communicated company-wide. Hence the decision packets are also the units for communicating the IT strategy to those who will be affected by it. It must, however, always remain possible to refer back to the meta-architectural level in order to explain the assumptions underlying the specific constructs chosen.

Micro-Architecture: This is the collection of detailed designs for implementation projects and for the ongoing management of operational systems. The timeframe is the company's ordinary short-term planning period, usually the financial year. It is at this level that short-term goals are set, resources are allocated, and implementation projects are started, continued, completed or abandoned. Policies are set out in detail, conformance is monitored, and variances are analyzed and interpreted. This is the main context in which errors and the conditions for error will be detected and fed back into the learning loops (Section 4.1.II.B.3.). Activity at this level, however, typically has a narrow focus, and relationships between the business vision and the detailed implementations may not be at all clear to those working here. Consequently, appropriate education and training must be provided to ensure that organizational IT learning can in fact take place (Section 4.4.V.A.3.).

An unavoidable consequence of directed incrementalism (Section 4.1.III.D.3.) is that conceptual and meta-architectural statements will tend to be somewhat abstract. Since it is crucially important that the generic constructs be practicable, i.e. capable of eventual realization, tests such as the following [cf. Lacey, 1976: 165] are recommended for all generic constructs proposed:

Realistic: Can the generic construct lead to one or more specific constructs that can be implemented within a foreseeable timeframe using technology that can be expected to be available, and within the resource constraints of the company?

Useful: Does the generic construct help to identify new strategic business systems, or enhancements to existing ones, with measurable competitive advantage?

Certain: Will the construct be understood in the same way by all decision makers concerned, and will they be able to use it confidently and appropriately?

Precise: Does it designate one particular entity in the overall context of strategic IT decision making, and no other, which can be justified, specified and implemented according to sound principles?

Organic: Does it fit naturally into the Target Environment Architecture? Does it help clarify:

> Physical boundaries - for example, of jobs, workgroups, business units, the company, strategic business systems?
>
> Logical boundaries - e.g. of rationality, of acceptable impact on mission and strategy?
>
> Relationships across these boundaries?

Relative: When instantiated, will the specific construct have a clear, consistent and compelling meaning in relation to <u>all</u> dimensions of <u>this</u> company's Target Environment Architecture?

The B+OL+D methodology [Benjamin, Seminar E-01: 3-1] suggests three further tests that can be applied to the meta-architecture as a whole:

<u>Completeness</u>: Is every possible requirement of the IT technology strategy covered by the complete set of generic constructs?

<u>Uniqueness</u>: Can every possible requirement of the IT technology be mapped to one and only one subset of generic constructs?

<u>Permanence</u>: Will the complete set of generic constructs be capable of adaptation (through organizational IT learning) to all foreseeable IT technology strategy requirements?

II. <u>THE IT INFRASTRUCTURE</u>

The IT infrastructure is the totality of all hardware, software, telecommunications, services, methodologies, skills and other tangible resources the company will require to create strategic business systems (Section 4.3.III.B.1.) that will fulfil the purposes and uses of IT (Sections 4.3.II.B. and 4.3.III.B.).

The architecture of this infrastructure is a set of blueprints, interface standards, policies and other logical constructs that provide direction for "technological base-building" [Bakopoulos and Treacy, 1985: 17], i.e. for developing the company's distinctive competence in the deployment of its IT resources (Section 4.2.I. and Figure 4). The aim is to provide the company with a base or capability on which it will be able to build new systems and assimilate new technologies, with minimum cost and lead time, as and when the needs emerge in the future.

The architecture defines inter-relationships among technologies, business systems and IT decision making processes, both internally and externally to the company. It focuses, not on specific technologies which are highly volatile, but on how technologies are to be managed to provide the features, functions and options needed; on how these can be classified to facilitate rational planning; and on how users inside and outside the company will have access to the business systems.

The external architecture gives the owners, users and operators an appropriate view of the features, functions and options of the infrastructure. There are many ways of defining generic constructs to present this view. Some architectures are data orientated (e.g. "Business Systems Planning" [International Business Machines, 1984]); some are resource (hardware, software and communications) orientated (e.g. "Systems Application Architecture" [International Business Machines, 1987]), and some are management-orientated (e.g. the Nolan, Norton & Company framework [Advanced Systems Inc., 1985: Course 5052]).

The present Framework, because of its close association with Benjamin's B+OL+D Methodology [Benjamin, Seminar E-01], is based on the "workstation paradigm". This is illustrated in Figure 15 and explained in the following Sections.

A. Generic Activities

The columns of Figure 15 refer to the four principal forms of business data: computational (e.g. date of birth, payroll number, prices, quantities); text (e.g. letters, reports, memos); image (e.g. charts, diagrams, pictures, E.C.G.s); and voice (e.g. telephone conversations, meetings) [cf. Campbell, 1982: 189].

From the point of view of IT infrastructure, the first set of generic activities that can be identified are the things that can be done to data, the operations shown in the rows of Figure 15: input and output, communication, processing and storage. In the present (and foreseeable) state of technology, there is no single device available to business that can perform all functions on a given form of data, or a given function on all forms of data.

One of the challenges in external architecture is to contribute to expanding the bounds of user rationality (Section 4.3.III.B.1.) by presenting the appearance of a single device that performs all the functions on all the forms of data, i.e. a "single system image". However, "... IT has to develop ways of handling information <u>in</u> <u>its</u> <u>most</u> <u>natural</u> <u>form</u> whatever that may be, e.g. if it is text then it should be kept as text, if voice then it is voice that should be stored, communicated and output. The medium should not distort." [Campbell, 1982: 192]

The second set of generic activities that can be identified is the things that can be done <u>with</u> data.

> "There is a danger ... that information technology will aim at the wrong target or at least a moving target. If office practices have been shaped by previous technologies then is it sensible to spend time analyzing tasks we perform in the office at the moment and try to apply technology to them? Should we not be spending time in taking a fundamental look at what we do in offices and why we do it?" [Campbell, 1982: 193]

By turning to what he calls "the office of yesterday" and considering how work was done before the picture was distorted by the introduction of IT, Benjamin describes four fundamental "automatable activities" [Benjamin, Seminar E-01, 3-2.1.1]:

> <u>Data</u> <u>Processing</u>: Creating and maintaining the operational records and files of the company and handling the transactions that constitute its business.

> <u>Information</u> <u>Processing</u>: Retrieving and manipulating data for management information and decision making purposes.

<u>Office Functions</u>: Keeping diaries, sharing and maintaining files, communicating by mail and by telephone, and so forth.

<u>Productivity Tools</u>: Forms design, statistical analysis, simulation techniques, and other aids to managerial and professional performance.

Another challenge in external architecture is to contribute to expanding the bounds of user rationality by providing the requisite kind and level of automation in each of these four categories, through the single system image, while at the same time providing internal safeguards over the integrity of business data and transactions.

For example, the operational data of a company is normally subject to institutional controls, while the control of data used in information processing is ordinarily regarded as a personal responsibility. A simple way of protecting operational data from unauthorized access and uncontrolled update is to keep the two kinds of processing physically apart, e.g. on separate machines. Modern software, however, such as the Millenium accounting package, often creates environments in which both data processing and information processing can be carried out simultaneously. Data protection then becomes an infrastructure design and management issue.

The significant architectural differences between data processing and information processing refer to such factors as: Scope - whether one or a few persons depend on the data, as opposed to an entire work-group or business unit; Duration - How long the data will remain relevant to the management of the company; Reproducibility - whether and how the data can be reconstructed in the event of damage or loss; Interfaces - how data is extracted from and fed back into operational data files; Control - the kinds of control required, e.g. operational data files may be updated in data processing but not in information processing.

"Importance" is not a distinguishing factor, since both data processing and information processing must be presumed to be important.

B. Generic Structures

Figure 15 shows five "virtual" structures through which a single system image of infrastructure features, functions and options can be developed and implemented incrementally over time. They are called "virtual" because their design is independent of the eventual choice of specific hardware and software.

The structures are based on Benjamin's [Seminar E-01: 2-3.3] "external meta-architecture" and Nolan, Norton & Company's "segmentation model" [Advanced Systems Inc., Course 5053]. They are consistent with IBM's "Systems Application Architecture Model" [International Business Machines, 1987: 11].

1. Virtual Workstation

This is a conceptual organization of infrastructure features, functions and options, and of all data forms and generic activities, as seen by a given individual. It is not tied to a particular location, and is implemented as much by software (which may be distributed across the network) as by the physical equipment. Tanenbaum [1981: 421-429] describes the hardware and software interfaces of a "virtual terminal", while Benjamin [Benjamin, Seminar E-01: 4-3.1] describes more general functions and features of the workstation from a utilization point of view.

The virtual workstation "represents" the individual user in the infrastructure architecture. It is the physical medium through which the bounds of rationality can be expanded at the individual level.

2. Virtual Network

The virtual network is a conceptual organization of the totality of all IT resources anywhere in the organization: the data communications networks (wide area and local area), computers and other hardware, software, databases and application program libraries that lie behind the appearances of the virtual workstation. The term "network" is used to emphasize that these resources are all to be regarded as inter-connected, if not through the data communications infrastructure, then at least to the extent that they share the same human support skills and conform to the same standards.

Subsets of the virtual network "represent" work groups, business units and the company as a whole in the infrastructure architecture. They are the physical media through which the bounds of rationality can be expanded at work group and other organizational levels.

Correct deployment of structures such as local area networks, departmental computers and inter-organizational systems is the necessary physical foundation for an effective binding of human systems and information systems into strategic business systems.

3. Virtual Applications Portfolio

This is a conceptual collection of all those features, functions and options of the IT infrastructure (e.g. software, interfaces, standards, protocols and so forth) that are required to support the present and potential generic application functions (Section 4.4.IV.A.).

Considered as a blueprint, the virtual applications portfolio should reflect the rationale or logical framework according to which the information systems developers agree to segment the strategic applications portfolio as this emerges in incremental planning (Section 4.4.IV.B.1.). This segmentation will be based largely on generic technological criteria, for the simple reason that both the business criteria and the technical specifics will only emerge over time.

Considered as a construct of the IT infrastructure, the virtual applications portfolio gives the minimal design standards which, if observed by developers, will allow specification of particular information systems to be deferred until the appropriate stage of macro- and micro-architectural planning arrives. It also allows these systems to be developed and implemented with minimum lead time and maximum flexibility of options.

4. Virtual Data Model

This is a conceptual collection of all those features, functions and options of the IT infrastructure (e.g. software, interfaces, standards, protocols and so forth) that are required to support the present and potential application data aggregates (Section 4.4.IV.A.).

Considered as a blueprint, the virtual data model corresponds to what Bascom & Kent call a "conceptual information model" (Section 4.4.III.B.), and like the latter it need not be defined very rigorously. As a construct of the IT infrastructure, it gives the minimum design standards for both the "conceptual" and the "external" views of present and potential data aggregates, in the sense defined by Date [1981: 21-23]:

> <u>Conceptual View of Data</u>: This is a meta-architectural concept, and refers to a representation of data "as it really is", rather than as users are forced to see it by the constraints of the hardware and software they are using. It is shown as the "Business Information" Box in Figure 16.
>
> <u>External View of Data</u>: This is a macro- and micro-architectural concept, and refers to the view given to the

user, by an application program, of a relevant portion of the database. It is to be distinguished from the "internal" view, which is a very low-level representation of how the data is actually stored in computer records. The external view is shown as the "Application Data" Box in Figure 16.

The virtual applications portfolio and the virtual data model are not meant to indicate particular kinds of software, or even one software approach as opposed to another (e.g. "object orientation" vs. "function orientation"). They are simply descriptions of the kinds of infrastructure elements that will be required to support agreed kinds of application functions and data. The architectural levels provide a rule of thumb to help infrastructure developers avoid falling into the trap of being too specific about virtual models: Meta-architecture - generic functions and data; Macro-architecture - specific kinds of software; Micro-architecture - branded software products.

Another pitfall decision makers have to avoid is to confuse the virtual applications portfolio and data model with the strategic applications portfolio (Section 4.4.IV.B.). The former are infrastructure elements, which will ultimately be realized as supporting software, interfaces, and standards, while the latter refers to the application programs and data that will developed in this context.

5. IT Support Organization

It was suggested in Section 4.3.III.B.1. that generic organizational processes and IT applications are likely to cut across the official forms shown in the organization charts. In the same way, the generic human skills and functions needed to formulate and implement IT strategy are independent of the official IT organization charts. In fact,

"The Data Processing department was the child of the

Computer Age. The Information Age also requires a strong central support agency, but the Information Technology Support Organization (ITSO) of the 90s bears little or no resemblance at all to the DP Department of the 70s. A smooth migration from DP Department to ITSO is not only a necessity for the careers of computer specialists and managers, but an absolute requisite for success in achieving the full benefit of information technology within the company. The ITSO, therefore, needs its own strategy for managing that transition, and for positioning itself to implement and support the [IT technology strategy]." [Benjamin, Seminar E-01, Section 6]

Developing the IT support organization is a crucial element of target environment development in the B+OL+D Methodology [Benjamin, Seminar E-01, Section 6] as well as in the Nolan, Norton & Company approach, where it is referred to as "leadership models for managing in the advanced stages" [Advanced Systems Inc., Course 5060]. The problem is one of striking a balance between differentiation and integration of company-wide strategic IT decision making responsibilities (Sections 4.1.III.D.1.) that is appropriate for the company, rather than the simplistic issue of centralization vs. decentralization. Strategic decision making tasks of the IT support organization are discussed in Section 4.4.V.C.2.

C. <u>The Internal Architecture</u>

The internal view of the IT infrastructure is needed by its own developers and, to some extent, by the developers of the human and information systems. As in the case of the external architecture, many different approaches are possible. Generally, the internal view is likely to be more complex than the external view, partly because of the scope and depth of technical detail involved and partly because the constructs have to be defined from multiple points of view.

For example, the B+OL+D architecture [Benjamin, Seminar E-01: Plate 16] defines a "cube" whose 3 x 3 x 3 = 27 sub-cubes present different facets of the same internal architectural constructs:

> Three Meta-Systems: Business Systems Management System; Workstation Management System; Network management system.
>
> Three Meta-Managers: Distribution Manager; Content Manager; Session Manager.
>
> Three Processor Packets: Central; Departmental; Personal.

An arbitrary number of "technical frameworks" can then be defined in terms of these facets, e.g. user/developer classification, processor transaction handling mode, data security domain framework, and so forth. A technical framework is, therefore, a particular kind of decision packet (Section 4.1.II.C.).

D. Generic Policies

The infrastructure architecture is the basis on which to build policies (directives, procedures, standards and protocols) for:

> The instantiation and realization of the five virtual constructs - workstation, network, applications, databases and support organization.
>
> Resource allocation and control.
>
> The acquisition of specific technologies.

Directives indicate, for example, which levels and classes of IT use (Section 4.3.III.B.) are appropriate for which kinds of application and data structures and which support arrangements. Much of the B+OL+D external architecture [Benjamin, Seminar E-01, Section 3-2.2] consists of tables of directives.

Procedures indicate, for example, how resources are to be acquired and controlled, how implementation projects are to be mounted, and how IT developers are to cooperate in carrying out their responsibilities. Application development and project management methodologies are familiar examples of procedures.

Standards specify, for example, the desired performance characteristics of mainframes, terminals, programs, programmers. Operators and users often formalize the standards governing their relationship as "service level agreements".

Protocols range from the familiar ones of data communications to more general organizational agreements on shared databases and systems, and agreements with vendors on conformity between their future technology developments and the company's emerging business requirements [Blauman, 1987].

Directives, procedures, standards and protocols based on the infrastructure architecture facilitate good organizational dialectic precisely because they are predicated on defined and discussable assumptions. Architecture restores to the term "policy" some of its earlier meaning as a synonym for "strategy", and makes the building of IT infrastructure in advance of future business systems a feasible technology strategy.

Three classes of policy can be described, which facilitate the identification of specific policies. They provide the foundations for the strategic, architectural and operational controls described in the Process Component (Section 4.5.III.; Figure 23).

> Business Management Policies: These map constructs of the Content Component to the external architecture, and thus constrain the design of infrastructure, systems and data, and the deployment of human resources. They are the basis for strategic controls.

For example, strategic business systems with interfaces external to the company may be subject to rigorous standards for reliability and security.

Architectural Policies: These map constructs of the external architecture among themselves and to the internal architecture. In general, they are the parameters of "good design". They provide the basis for architectural controls.

For example, automated office facilities and automated personal tools will be available for both data and information processing, and there will be policies to indicate which facilities and tools are acceptable in which kinds of processing. A LOTUS spreadsheet is a well-accepted tool for information processing, but not for data processing except possibly in very small organizations.

Operational Policies: These map constructs of the external and internal architectures to the IT management strategy. They provide the basis for operational and user control over implementation.

For example, there may be policies governing when generic constructs will be developed in-house and when they will be bought in. Contingency plans for supplier failure, disaster and so forth also fall into this category.

III. HUMAN SYSTEMS

It is a basic tenet of this Framework that effective decisions about information systems cannot be made separately from the human systems they are intended to support, and this principle is embodied in the concept of a strategic business system (Section 4.3.III.B.1.). The approach to formulating these two dimensions of the target environment uses Bascom & Kent's [1984] framework of "Business Information Architecture".

The top half of Figure 16 refers to the human systems part of strategic business systems, i.e. business processes (generic organizational processes), organization structures (generic configurations of tasks, roles and responsibilities), and business information (data "as it really is").

Business Information Architecture as described by Bascom & Kent focuses on alignment IT strategy, but it can be made to apply to impact IT strategy through the extensions shown in Figure 16. In the top half, the broad lines connecting the Business Processes and Business Information Boxes to the Organization Structures Box represent the dialectical activities of organizational development and organizational learning (Section 4.2.I.; Figure 4), through which persistent older organizational forms are systematically replaced by new structures and processes that arise in response to competitive strategy implementation (Section 4.3.III.B.1.).

A. Business Processes

Porter's [1985: Ch. 2] characterization of the business unit as a chain of value-creating activities effectively links the concept of a strategic business system to that of competitive advantage. According to Porter, the strategic aims of a business unit are reflected in the technologically and economically distinct activities it performs to do business. These are called value activities. Value created is measured by the amount customers are willing to pay for the end product or service of the chain of value activities.

Theoretically, total value can be broken down into the values contributed by each generic value activity. A business unit is profitable when the total value created exceeds the total cost of the value activities. It will achieve competitive advantage when it can perform these activities either at lower aggregate cost than the competition, or in a way that leads to a product which, in the eyes of buyers, is so significantly different from the competition that they are willing to pay a premium price for it.

As shown in the upper half of Figure 17, nine generic activities make up a value chain. There are five primary activities concerned with the physical creation, marketing, delivery and support of the product - "inbound logistics", "operations", "outbound logistics", "marketing & sales" and "service". There are three kinds of support activity, which may or may not be shared by several of the primary activities - "human resource management", "technology development", and "procurement". Finally, there is "firm infrastructure", e.g. general management, legal, accounting and data processing, which is shared by all value activities. Internal linkages exist where the performance of one of the nine value activities affects the cost of or value created by another.

A diversified company or business unit can be considered to have several value chains, one for each product line, sharing some or all of the support activities. Each value chain may be considered to represent a generic "line of business", and this may correspond to some ideal "strategic sector", "strategic business unit" or "strategic planning unit" [Ohmae, 1982: 142-145] of the company. It would, however, be a mistake to commence analysis on the assumption that an existing business unit of the official organization chart *ipso facto* constituted a value chain.

The value chains of the company and its strategic targets, considered together, make up the "value system" shown in the lower half of Figure 17 - supplier, company, channel and buyer value chains. External linkages arise out of dependencies between the company's value chain(s) and those of its strategic targets. For example, the company can differentiate its product or service by establishing linkages with its customers' or distributors' value chains.

Many of the generic competitive strategies referred to in Section 4.3.II.B. rely on inter-organizational systems, i.e. strategic business systems that span organizational processes in both the company and its strategic target. Hence, in studying an opportunity for competitive advantage through IT, the company would ideally want to analyze not only its own value chains but also those of the target. It is unlikely, however, that all the necessary information (in effect, the target firm's production functions) will be available for inspection, and alternative analysis techniques will be necessary.

For example, the company's products are its customers' resources, and sufficient information would normally be available for a company to study how it can assist its customers in managing their resource life cycles. Ives and Learmonth [1984] have formalized the concept of a "customer resource life cycle" to provide a suitable technique for this purpose. It is an expansion of BSP's well-known 4-stage life cycle [International Business Machines, 1984: 29] into thirteen more detailed stages, and it shifts attention from the company's own cycle to that of the customer.

> "The products that an organization provides to its customers are, from the customer's perspective, supporting resources. To acquire them, the customer goes through a resource life cycle. This frequently requires a considerable investment of time and effort to manage. If the supplier can assist the customer in managing this life cycle, the supplier may be able to differentiate itself from its customers, usually on the basis of enhanced customer service or, in some cases, by introducing direct cost savings." [Ives & Learmonth, 1984: 1194]

The Porter value chain and the Ives & Learmonth customer resource life cycle are powerful concepts because of their two-fold use in analysis: they help in identifying strategic opportunities for the use of IT, and in developing the human and information systems to exploit them. With regard to opportunity identification, the concepts help in finding opportunities for new strategic business systems, or new strategic purposes for existing business systems. At the intuitive level, both techniques can be used to spark ideas for creative uses of IT in competitive strategy [e.g. Ives, Sakamoto & Gongla, 1986]. At the analytical level, competitive advantage (Section 4.3.IV.C. and Figure 13) can be seen as a function of the value chain and value system:

> Competitive Position: The company's ability to differentiate itself from its competitors reflects the contribution of each value activity towards fulfilling buyer needs, as well as an effective linkage of its value chain with those of its suppliers ("upstream value") and of its buyers ("downstream value").
>
> The company's cost position reflects the aggregate cost of performing and co-ordinating all its value activities, relative to the competition.
>
> Strategies of broad scope can exploit linkages between business unit value chains serving different industry or market segments and different geographic areas. Strategies of narrow scope can tailor the company's value chain to a particular target segment. Strategic alliances interlock parts of the company's value chain with those of its allies.
>
> Organizational Effectiveness: Every value activity has a physical and an information processing component. By creating strategic business systems that reconfigure the value chain, the balance between these components can be altered to bring about significant improvements in the company's production functions (Section 4.3.II.A.3.). For example, in many industries (e.g. steel mills) scale is no longer a prerequisite for automation, and automation no

longer necessarily entails inflexibility. Similarly, most products have a physical and information component, the latter being everything the buyer needs to know to obtain and use the product. IT makes it feasible to provide far more information along with the product or service.

Synergy: Synergistic effects are possible whenever IT is applied to the internal linkages of a value chain, or to linkages between the several value chains of the company, or to the value system itself (through inter-organizational systems).

Porter and Millar [1985] define the concept of "information intensity", a two-dimensional measure combining the relative degree of IT use in the value chain with its relative degree of use in the product. This concept generalizes the familiar idea that in some companies "the system is the product" (e.g. banks, insurance companies), while in others the systems support the product or service (e.g. manufacturing, travel, hotels).

Bascom & Kent [1984: 25-26] propose three dimensions in human systems architecture:

Management Functions: Plan, Control, Execute.

Planning Levels: Strategic, Tactical, Operational.

Functional Decomposition: The hierarchical structuring of processes into sub-processes, according to well-defined rules [Bascom & Kent, 1984: 7-8; Gane & Sarson, 1977; Ross & Brackett, 1976].

The value chain and customer resource life cycle concepts add a fourth and even more fundamental perspective:

Generic Value Activities: Value chain activities and linkages, or customer resource life cycle "stages".

This dimension also permits the analysis of business processes to be linked directly to application functions and data, and to applications portfolio planning. It is thus the principle means of ensuring good fit between human systems and information systems, and ultimately congruency between IT purposes and uses.

B. Business Information

At the meta-architectural level, business information is represented by a "conceptual information model", i.e. the conceptual view of the data referred to in Section 4.4.II.B.4. This is not meant to be a particular kind of diagram or a particular level of abstraction, but simply a description of the information, which can be displayed in various forms (lists, tables, diagrams, text) and at various levels of abstraction or detail [Bascom & Kent, 1984: 36]. The model would be completed incrementally as the "external view of the data", as it evolves through the macro- and micro-architectural levels, not always in a top-down sequence.

Bascom & Kent [1984: 27-40] describe a simple but effective way to analyze the structures and flows of the "real world" information on which business processes act. The smallest unit of information is the "fact", which represents a business "entity" or a "relationship" between entities. "Information classes" are aggregates of business information. Because the concepts are developed in sound set-theoretic terms, Bascom & Kent's technique is general enough to be useful in a variety of business problem analysis methods - for example, IBM's BSP, Gane & Sarson's [1977] "structured systems analysis" and de Marco's [1978] "structured analysis".

C. Inter-Organizational Systems

Because inter-organizational systems can expose the company's internal processes to its strategic targets, and its organizational planning to the latter's IT decision makers, they constitute a special class of strategic business systems with risks that demand senior management attention.

If the inter-organizational system permits the sharing of application functions and data by several companies, then inevitably the corresponding business processes and business information of the participating companies will interlock. According to Cash & Konsynski [1985], the impacts this will have on the company's own organization tend to appear first as changes in business processes and communication patterns. These can lead to changes in skill requirements and job definitions and eventually, if key functions are affected, to changes in the organizational design and even the mission and competitive strategy. The sequence of internal changes seems to depend on whether the company is reacting to someone else's inter-organizational system or is itself initiating or implementing the system, and on whether or not top management participates in the decision making.

Cash & Konsynski [1985] provide a framework to help management decide whether and on what terms to participate in proposed inter-organizational systems.

D. The Internal Architecture

The internal architecture of human systems, which may be taken to include the external ergonomic features of the "man-machine interface" [Carey, 1982; Galitz, 1980], is the traditional terrain of organization and methods (O&M) specialists. With the spread of online systems usage in offices and factories, this is becoming an increasingly important field of specialization, but the details lie well beyond the scope of the present Study.

An important point must, however, be made. IT suppliers, such as IBM and Xerox, do a considerable amount of "office systems research" [e.g. International Business Machines, 1982; Ellis, 1979, 1983; Ellis & Nutt, 1979], with a view to automating some office functions and providing real-time information systems support for others. If this work were to be taken up in business systems design, the bounds of rationality could be extended by virtue of a better fit between business processes and application functions. The "information control net models" described by Ellis, for example, can help in analyzing and redesigning business processes to reap this benefit.

> "Information control nets have been applied to existing offices and to hypothetical automated offices. ... The typical large office of today is a complex, highly parallel, interactive information processing system. Understanding of current offices and the design of future offices can be greatly aided by the leverage available from a mathematical model. Whereas the office of the past has been able to slowly evolve and correct mistakes as it does, this may not be adequate for the future: technological change may be rapid and radical. This level of mathematical rigor is the main separation between our work and other documented office studies." [Ellis, 1979]

IV. INFORMATION SYSTEMS

The lower part of Figure 16 refers to the information systems part of strategic business systems, i.e. application functions and the application data they act on. At the meta-architectural level, both the functions and the data are generic and independent of the specific programs and databases in which they will eventually be realized.

A. Information Systems Architecture

The information systems architecture consists of an applications architecture and a data architecture.

> "In contrast to business processes and information which are independent of method or technique, application

functions and data are implemented on a computer system. Application architecture is concerned with applications currently installed and operational, those under development, and those planned for the future." [Bascom & Kent, 1984: 41]

The external architectures systematically define the collection of functions provided by all the applications in the inventory of all strategic business systems, and the data flows among them. As instruments of idealized design (Section 4.1.III.A.), the architectures can only be implemented incrementally. At any point in time, however, it must be possible to map the existing business processes and information to the existing applications and data (macro- and micro-architectures), and the ideal business processes and information to the ideal applications and data of the target environment (meta-architecture).

Bascom & Kent [1984: 47-53] describe an application data model, consisting of data "aggregates", "clusters" and "elements" corresponding to the information "classes", "facts" and "relationships" of their business information model.

> "A <u>data aggregate</u> is any useful grouping of data. The smallest data aggregate is a cluster of data elements that represent a single fact (employee number plus department number means employee is assigned to department). The largest data aggregate would probably contain all the data relevant to a large application area. Typical data aggregates are databases and other master files, records or segments of databases and files, application-to-application interfaces, user-to-application interfaces, and interface records." [Bascom & Kent, 1984: 47-48]

Because this data model is quite general, and is translatable into relational data structures [Date, 1981: Ch. 4], it can be applied to any of the three major database approaches - relational (e.g. IBM's DB2), hierarchical (e.g. IBM's IMS) or network (e.g. Cullinet's IDMS, which is based on the CODASYL Database Task Group recommendations).

In the external architecture, data aggregates are not disjoint, since they are merely views of arbitrary subsets of all data elements and clusters. It is indeed a generally accepted principle of database design to minimize "data redundancy" (the physical replication of data clusters) by giving several application programs their own "external" views of what is essentially the same internally stored data.

In this Framework, the units of incremental information systems implementation are as follows:

> Application Function Packet: A practical subset of application functions that can be programmed and run in support of a corresponding subset of business processes.
>
> Application Data Aggregate: A practical, not necessarily disjoint, subset of data clusters and elements, which will become the external view of the data offered by an application function packet.

In the lower half of Figure 16, the broad lines connecting the Applications Functions and Application Data Boxes to the IT Infrastructure Box represent the creation, in advance, of strategic IT capability on the basis of assumptions agreed and made explicit in the five virtual structures described in Section 4.4.II.B.

The crucial design step is the identification and agreement of "interfaces" in both application functions and data.

> "Functions communicate through interfaces, i.e., they send data to each other. ... We can detect or recognize an interface when one party writes data and another party reads the same data. We are interested in application

program and user interfaces because they are the 'glue' that binds together the applications and users into a system." [Bascom & Kent, 1984: 44]

Three kinds of interface must be identified if incremental implementation of application functions and data is to be feasible:

<u>User Interfaces</u>: The mapping of business processes and information to application functions and data, as indicated by the "support" lines in Figure 16. This is partly a matter of internal business systems architecture - e.g. the use of information control net models (Section 4.4.III.D.) to map generic organizational processes to generic application functions - and partly an issue of infrastructure design, i.e. agreement on the design of the virtual structures (Section 4.4.II.B.).

<u>Systems Interfaces</u>: The agreed interfaces between different application function packets and application data aggregates. Standard interfaces permit program modules to be designed and implemented incrementally, as and when the business needs emerge. Similarly, standard interfaces in data designs permit new segments of the overall database to be designed and latched into segments that have already been implemented. For example, Heimbigner & McCleod [1985] describe a "federated architecture" for the sharing and interchange of data among autonomous database management systems.

<u>Infrastructure Interfaces</u>: The architectural policies and supporting software arising out of the virtual structures described in Section 4.4.II.B. which, if they are adhered to, guarantee that future business systems and the particular information technologies they will require can be assimilated into the infrastructure cost-effectively and with minimum delay.

The SQL database management systems [Finkelstein & Pascal, 1988] make it possible to define a generalized "logical data interface" that will provide for any future data access requirement, in terms of algebraic functions (join, projection and selection) defined on an arbitrary and dynamic collection of data "tables".

In the same way, the "online engine" software developed at Old Mutual makes it possible to define a generalized "logical procedure interface" that will provide for any future online transaction or session requirement, in terms of control transfer functions (e.g. call, nest, get) defined on an arbitrary and dynamic collection of program "modules".

B. The Applications Portfolio

The "strategic applications portfolio" is a way of looking at the totality of all the strategic information systems (i.e. the information systems parts of strategic business systems) of a company or business unit. The concept is important from both the business and the IT points of view.

1. The Business Perspective

In many companies, rising levels of IT expenditure are reaching the limits of affordability when accounted for as administrative and even sales/manufacturing expenses. If such a company is positioned in the Strategic or Turnaround Boxes of Figure 12 (Section 4.3.IV.A.), then it should seek another way of justifying the level of expenditure required. One way is to regard the IT infrastructure and strategic information systems as a portfolio of durable assets and to manage them accordingly.

Nolan, Norton & Company have long promoted the idea of a "normative applications portfolio" [Nolan, 1982: Ch. 5; Advanced Systems Inc., Course 5054] as a product/service mix approach to managing IT. Questions such as the following are to be asked and answered:

> What levels of investment in particular IT functionality and service are required, and how are they justified?
>
> When do particular technologies and systems reach obsolescence, and what provision is made for this?
>
> Which business processes are supported by which technologies and systems, at what cost and for what purpose?

These are project-orientated questions, and they must always be asked in the overall context of the "aggregate" questions of IT positioning (Sections 4.3.IV.C. and 4.5.III.A.).

Following Nolan, Norton and Company, three basic concepts driving applications portfolio management can be identified:

> Segmentation: The total collection of present and potential application functions and data can be segmented in some meaningful way. The Porter value chain and Ives & Learmonth customer resource life cycle (Section 4.4.III.) provide the natural schematic for this Framework, but there are other options - for example:
>
> > Nolan, Norton & Company's original "normative applications portfolio" [Nolan, 1982: Ch.5], which is based on Anthony's [1965] 3-tier planning framework.
> >
> > Blumenthal's [1969: 76, 81] taxonomy of operational control systems, based on Anthony's framework and Forrester's [1961] analysis of the six networks that describe the flow of resources in the organization (materials, orders, money, personnel, capital equipment and information).

BSP's [International Business Machines, 1984: Ch. 8] information architecture matrices.

BIAIT Systems Inc.'s [1986] enterprise analysis model, which classifies business activities according to management level (strategic, tactical, operational, control) and functional area (markets, resources, deliverables and results).

Evaluation: If the collection of applications is to be regarded as a portfolio, then it must be evaluated. The natural measure of value in this Framework is competitive advantage, as described in Section 4.3.IV.C.

In addition, McFarlan [1982] provides a comprehensive approach to evaluating project risks and the overall portfolio risk profile. The critical dimensions of this analysis are:

Company experience with the technology, i.e. the state of organizational development and learning relative to the particular technology or system being evaluated.

Project structure, i.e. factors in the organizational dialectic such as management understanding, decision maker consensus, and stability of management aims.

Project size, e.g. expense, staffing, elapsed time, number of decision making constituencies involved.

Portfolio Management: Managing the portfolio requires asset-orientated management philosophies and techniques. The following are some of the criteria for portfolio management, which can be used to compare the actual portfolio with the ideal and with the competition:

Coverage, i.e. the relative information intensity

(Section 4.4.III.A.) of the processes and products covered by different segments of the portfolio.

Balance, i.e. the distribution of coverage, relative to the criticality of the processes and products covered.

Maturity, i.e. the age of the systems in different segments of the portfolio, relative to the criticality of the processes and products covered.

Company experience, i.e. the risk of failure due to inexperience in particular segments of the portfolio.

2. The Technical Perspective

From the IT point of view, the strategic applications portfolio is the totality of all application function packets and application data aggregates, considered in the light of the infrastructure features, functions and options they depend on. The proper level at which to plan a portfolio is the line of business or business unit, not the company as a whole. Business unit management would generally accept this as a fact consistent with their management autonomy, but the following considerations are also important:

A strategic business system has been defined (Section 4.3.III.B.1.) as a set of generic organizational processes supported by generic IT applications, and this is reflected in the human and information systems architectures by the close mapping of business processes and information to application function packets and application data aggregates. Since the line of business with its value chain is the level at which the purposes and uses of IT can be matched to achieve measurable competitive advantage, it follows that it is also the natural unit for applications portfolio planning.

This means that the value chain framework can be used for applications portfolio segmentation as confidently as it can for the analysis of business processes. It also means that subsets of IT purposes and uses can be rigorously mapped to portfolio segments (subsets of application function packets and application data aggregates).

A third advantage is that IT policies can be specified as appropriate to a business unit, and they need not be the same for all business units. Company-wide policies then become a matter of compatibility, not uniformity. For example, different systems development and project management methodologies may suit different business units; purchased software may be suitable for some business units, in-house development for others; real-time data entry systems may be standard data processing practice in one business unit, batch in another.

On the other hand, there is the danger that by focusing too exclusively on the business unit planners may overlook such requirements as do exist for company-wide data models and application interfaces. This could cause problems if and when systems and databases have to be restructured as a result of company reorganization at the business unit level (business portfolio strategy - Section 4.3.II.).

Figure 18 is an outline of a strategic applications portfolio segmentation scheme based on Porter value chain concepts:

<u>The</u> <u>IT</u> <u>Infrastructure</u>: These are the features, functions and options that existing and future strategic information systems, as currently envisaged, will require. In particular, the virtual applications portfolio and data model provide the major technological guidelines for the incremental implementation of application function packets and application data aggregates.

<u>Strategic Information Systems</u>: These are the application function packets and application data aggregates, existing and foreseen, grouped according to the value chain activities and linkages they cover - firm infrastructure activities, business unit support and primary activities, and shared activities.

C. <u>The Internal Architecture</u>

The internal applications and data architectures are matters of software design representation [Freeman, 1978(1) and (2)] and lie in the field of software engineering. There is an abundant literature - see, for example, the I.E.E.E. Transactions on Software Engineering.

Many proprietary methodologies are on offer - e.g. Softech's "Structured Analysis and Design Technique" (SADT) [Lucas, 1985: 140; Ross, 1977; Ross & Bracket, 1976; Ross & Schoman, 1977], Teichroew's "Problem Statement Language/Analyzer" (PSL/PSA) [Teichroew & Hershey, 1977], and Yourdan and Constantine's [1979] "Structured Design". For useful overviews see Advanced Systems Inc. [1978] and Freeman [1979] .

V. <u>HUMAN RESOURCES</u>

A human resources "architecture" is the blueprint for an ideal structuring of decision making tasks and processes. This architecture will be implemented incrementally in the same way as any of the other three dimensions of the target environment. Hence it would be part of the IT management strategy (Section 4.5.II.) to ensure that human resources development keeps pace with the evolving requirements of the other three dimensions.

A. <u>The Aims of the Architecture</u>

The fundamental aim of a strategic business system has been stated to be the extending of the bounds of rationality in decision making and task performance in all four domains, and at all levels of IT impact on the organizational design (Section 4.3.III.B.1.). It follows that the roles involved in defining and implementing the purposes and uses of a strategic business system must reflect "the collective wisdom of some relatively homogeneous group of experienced managers rather than the needs as perceived by any individual or by any group of experienced managers" [Ghymn & King, 1976: 598]. It is, however, an explicit assumption of this Framework (Section 4.2.II.) that in a large enough company these decision makers will in fact constitute a heterogeneous group, with multiple backgrounds, orientations and motives.

The general aim of a human resources architecture can, therefore, be defined as the provision of a framework of generic decision making roles, tasks, responsibilities and success criteria, within which many persons with many and varied attributes can interact in an orderly and productive manner, resulting in good organizational dialectic.

In the process of customizing the Framework for a specific company, this general aim can be made specific with the aid of the following tests for good dialectic, adapted from Argyris & Schön [1978: 145-146]:

> Strategic IT decision makers should be ready to challenge organizational assumptions and to search for "dis-confirming data".
>
> They should be able to synthesize their various theories-in-use (Section 4.2.I.) into a single set of shared images and maps - the Corporate IT Scenario(s), the IT Positioning Statement, the Target Environment Architecture, the staged Master Transition Plan and the Organizational IT Learning Systems - which clarify the inter-connections of all relevant data, assumptions and conclusions.

They should remember the successes and failures of the past, which gives them a context for interpreting present error and enables them to proceed through the appropriate learning loops (Section 4.1.II.B.3.).

They should be able to respond to uncertainty - for example, when expectations to achieve specified goals are continually disappointed - with efforts to restructure their perceptions of the problem.

They should always test:

> Theory-In-Use vs. Espoused Theory - "Do we really believe our stated reasons for adopting/rejecting this proposal?"
>
> Data vs. Assumptions - "Is what we really believe really so?"
>
> Competitive Strategy vs. Organizational Design - "Will these processes do the job required by this strategy?"
>
> Distinctive Competence of the Company vs. Decision Makers' Competence - "Are we capable of managing this strategy, or this strategic business system?"
>
> IT Purposes vs. Uses - "Is the system we are asking for, and the cost of developing it, what we truly require to achieve our stated objectives?"

They should be aware that inter-personal conflicts often arise out of contradictions in organizational ends, norms and means. While they should advocate their own positions as ably as they can, they should also enquire into the positions of others and be willing to consider a restatement of the problem that might allow both sets of values to be met. They should always take pains to evaluate the "costs of victory".

A human resources architecture will, therefore, set out guiding principles for structuring and staffing strategic IT decision making in a way that will lead to good organizational dialectic. An external and an internal architecture can be defined: the former would refer to the external, objective aspects of decision making, i.e. roles, tasks, responsibilities and success criteria; the latter would refer to the personal, subjective aspects of the decision makers, i.e. their careers, attributes and developmental requirements.

Figures 19 to 21 are frameworks to help in such a structuring of strategic IT decision making.

B. Strategic IT Decision Making Roles

Figure 19 is based on Figure 5 and the organizational development technique, "environmental mapping" [Beckhard & Harris, 1977: 62].

1. Decision Making Domains

If the aim were simply to reduce heterogeneity in a description of existing strategic IT decision making roles, then domains could be derived empirically through the use of data analysis techniques. For example, Ghymn & King [1976] used discriminant analysis to isolate homogeneous classes of management information system users. Their approach could be adapted to investigate whether there exist in the company relatively homogeneous classes of managers and other employees, according to the importance they attach to various aspects of strategic IT decision making.

In this Framework, however, the four defined domains - Owners, Developers, Users and Operators (Section 4.2.II.C.) - refer to roles in the organizational dialectic of an ideal target environment, and as such may not be very closely related to any current responsibilities as set out in official organization charts.

Two further qualifications of the four domains are shown in Figure 19 - levels of participation of the decision making roles in the tasks, and communication factors that will limit the effectiveness of role incumbents.

2. Levels of Participation

The three levels of participation in each decision making domain are: facilitative, directive and active. It is a well accepted management principle that, when decision making is participative, the decision making roles should be defined to be as near as possible to the source of the relevant information or the locus of the action. From this point of view, the three levels can be regarded as ranges of "organizational distance" from the hypothetical core of a strategic IT decision, within which it is convenient to classify the decision making roles. (Implications regarding leadership style that are often associated with the terms facilitative, directive and active are not intended here.)

> Facilitative: These are roles outside the company, which influence the external IT planning environment. Examples in the business domain are government and regulatory bodies, trade associations, trade unions, and management and users at the other end of inter-organizational systems. Examples in the IT domain are telecommunications authorities, computer professional and management associations, and technology suppliers.
>
> It is implicit in the principle of interactive planning (Section 4.1.III.A.) that the facilitative level should be taken into account in the company's IT decision making processes. Since these persons do not normally participate directly in the internal processes of an organization, it should be part of the IT management strategy to ensure that the company is adequately represented in the appropriate external bodies.

<u>Directive</u>: These are roles inside the company that create the favourable conditions necessary for effective decision making. They give direction to those nearer the core of the decision through, for example, the allocation of finance, manpower and other resources, the authorization of IT policies, the overall management of the business systems portfolios and the IT infrastructure, and the resolution of conflicts. It is their task to authorize or veto strategic IT decisions.

These roles are characteristic of the authorization step in Mintzberg's [1979: 188] "continuum of control over the decision process".

<u>Active</u>: These are roles directly involved in some aspect of carrying out a strategic IT decision making task. They are characteristic of the other steps in Mintzberg's continuum of control: Information - persons who provide requisite information or who need to be kept informed; Support - persons who provide advice or other kinds of support to those who have to make the choice; Choice - persons directly responsible for making the choice; Execution - persons responsible for giving effect to the decision, i.e. producing the intended outcome.

A given person could be fulfilling a role at the directive level in some decision situations and at the active level in others. It is also believed that some persons perform better at some of these levels than at others.

3. Communication Factors

In constructing a practical system of strategic IT decision making responsibilities, it is not sufficient to consider only the organizational issues of role, task and level of participation. Behavioural issues pertaining to the role incumbent must also be taken into account. For the purposes of this Framework, the issues are condensed into two communication factors, "semantic gap" and "power asymmetry" [De Brabander & Thiers, 1984], which create the potential for contradiction and conflict in the decision making process.

De Brabander & Thiers investigated how the ways in which users become involved in application development projects affect the success of systems produced, on the assumption that effective communication is the crucial intervening factor. Their argument can be generalized for this Framework by considering how IT decision making success is affected by the ways in which role incumbents from all domains and levels become involved, on the assumption that good organizational dialectic is the crucial intervening factor.

In any decision making process, good dialectic will have occurred when the parties' mutual agreement to implement a proposal, or to abort it, is free and based on the sharing of all relevant assumptions and data. Dialectic will have been poor when the decision is made on the basis either of forced consensus (as a result of power asymmetry), or of mismatched assumptions or incomplete data (as a result of semantic gap).

Such agreement is unlikely to be maintained when the party forcing consensus is no longer on the scene or fails to follow-up, or when the mistaken assumptions or data are confronted by reality. The outcome is invariably loss of time and effort, and disappointed expectations in one or more of the domains - for example, owners who resent the waste of time, effort and opportunity in bad projects; developers whose designs have been distorted; users whose work has been hindered rather than helped; and operators hassled by endless requests for program changes and reruns. The outcome of decisions reached through bad dialectic could, indeed, be a counter-strategic business system.

If the findings of De Brabander & Thiers' study are generalized to the broader context of strategic IT decision making in this way, then two strong requirements for good dialectic and hence for the structuring of decision making responsibilities become, in Nolan, Norton & Company's terminology [Advanced Systems Inc., Course 5060]:

> Paradigm: A shared business vision for IT, based on shared assumptions and beliefs regarding the purposes and uses of IT in company strategy. It is an objective of the system of decision making responsibilities to ensure that all strategic IT decision makers have the opportunity to participate in the dialectical enquiry of the Context Component and the strategic option generator of the Content Component in a way that eliminates semantic gap.

> Balance of Power: The relative power of the decision making domains and levels of participation is a crucial factor in the continuum of decision making control [Mintzberg, 1979: 187-188; see also Solomon, 1983]. It is, therefore, also an objective of the system of decision making responsibilities to ensure a balance of power such that no person or coalition has the ability to force consensus on the other participants, e.g. through the real or perceived power to administer "side-payments" or punishments [De Brabander & Thiers, 1984: 140]

The particular effects of these communication factors will depend on company culture (Section 4.3.V.B.) and on the stage of company development (Section 4.6.III.). Persons responsible for structuring the system of decision making responsibilities will, therefore, require some kind of diagnostic tool to help determine what is appropriate for their companies. Until such time as empirical research provides guidelines for this purpose, there is value to be obtained in transposing available behavioural theories to this context. Two such are:

> McGregor's [1960] "Theory X" and "Theory Y".

Churchman & Schainblatt's [1965] four "communication positions" between parties with different backgrounds and fields of competence.

The situation in companies where there is a general reluctance to become involved in the decision making activities in domains other than one's own is remarkably like McGregor's [1960: Ch. 3] Theory X:

> Business managers display an inherent dislike of systems thinking (too vague) and the systems development process (paralysis by analysis), and avoid these if they can. Because of this, they must be cajoled, sold and threatened into serious participation in IT decision making. They prefer to have their IT opportunities and strengths managed for them, and wish to avoid any responsibility for threats and weaknesses.
>
> The IT managers and specialists, on the other hand, show an inherent dislike of business thinking (too mundane) and administrative tasks (too bureaucratic), and avoid these if they can. Because of this, they must be cajoled, sold and threatened into serious participation in strategic planning and participative decision making. They prefer to have the business objectives and IT purposes and uses spelled out for them, and they wish to avoid responsibility for any failure of the applications to meet requirements.

In such circumstances, a system of decision making responsibility could be built around any of the first three of Churchman & Schainblatt's communication positions:

> <u>Separate-function</u>: The tasks of the business and IT domains are treated as essentially separable. The business domain formulates the purposes and uses of IT, taking into account whatever IT professional advice it asks for and finds. The IT domain produces the IT infrastructure and

information systems as completely and efficiently as possible.

Persuasion: This position calls for more understanding of IT on the part of business people - what the technologies are and how they can be applied to competitive purposes and organizational design. The business people draw closer to IT decision making, typically by participating in systems design, or in the choice of personal computers, local area networks and other technologies.

Communication: This position calls for more understanding of business on the part of the IT people. They draw closer to business decisions regarding organizational design and, if their credibility is high enough, competitive strategy. They remain almost totally responsible for system design, but they act as communicators, educators and marketers in the business domain, typically through such roles as business analysts and information centre personnel.

There are, however, companies where the IT planning environment resembles McGregor's [1960: Ch. 4] Theory Y:

The effort involved in systems thinking and formulating IT strategy is natural and congenial to businessmen, and management decision making is equally stimulating to IT specialists. Side-payments and penalties are not effective means of bringing about participative decision making.

Both business people and IT people exercise self-motivation and self-direction in creating IT solutions in the service of the business ideals to which they are jointly committed. Commitment to business ideals and IT solutions is a function of the personal satisfaction of being a successful entrepreneur or a successful organizational innovator.

Under appropriate conditions and with appropriate guidance, business managers and IT specialists learn not only to accept but to seek responsibilities in the other decision making domain.

The capacity to exercise a relatively high degree of imagination, ingenuity and creativity in devising IT solutions for business ideals is widely, not narrowly, distributed in both the business and the IT domains.

The opportunities and threats of the modern competitive environment, and the rapid growth in the functionality and capacity of modern IT, have as yet barely begun to tap the intellectual potentialities of ordinary people in both the business and the IT domains.

In such conditions, a system of decision making responsibilities can be built around the fourth of Churchman & Schainblatt's communication positions:

<u>Mutual</u> <u>Understanding</u>: Owners and users in the business domain learn what drives IT, by actively acquiring and exercising some IT design and management skills. The spread of personal computers is characteristic of this trend. At the same time, developers and operators in the IT domain set about emulating owners and users by acquiring some skills in financial management, factory management, marketing and so forth, in an effort to manage the IT function as a "business within a business" [Nolan, 1982: 237]. Distribution of systems development and other IT functions is typical of this position.

C. <u>Structuring the Strategic IT Decision Making Tasks</u>

Strategic IT decision making tasks can be aggregated in terms of the various committees and support functions that help in co-ordinating them. It is convenient to consider the tasks at this level of aggregation because it allows discussion to be considerably shortened and maps the tasks directly to the focal points of activity. The structuring described in this Section is, however, only one possibility - there are many others.

1. <u>Co-ordinating Bodies</u>

In participative decision making, co-ordinating bodies are needed to ensure that roles and tasks are correctly identified and that the agreed responsibilities are carried out in an orderly way. Some of these bodies would be concerned with formulating decision packages, while others would co-ordinate implementation activity within a particular decision packet.

There is an extensive literature on IS steering committees, which can used as starting points in developing guidelines for the co-ordinating bodies - see, for example, Doll [1985]; Doll & Ahmed [1984]; Nolan [1982: 370-383]; McKeen & Guimaraes [1984]; Umbaugh [1984]. It must be remembered, however, that this is a dialectical Framework, focusing on generic, not necessarily official, organization structures and processes. Hence the co-ordinating bodies should be more concerned with contradiction than with conflict, with synthesis than with consensus, and their roles will be active as well as directive. For example,

> "... general managers must be involved to ensure that cross-functional linkages, more possible to achieve with information technology, are exploited ... Rather than control information technology ... an IT manager should co-ordinate the architecture and standards of the many applications throughout the organization, as well as provide assistance and coaching in systems development."
> [Porter & Millar, 1985: 159]

The examples of co-ordinating listed below are based on experience at Old Mutual.

<u>Corporate</u> <u>Steering</u> <u>Committee</u>: These are senior executives in the business and IT domains. They are the main participants in the dialectical enquiry of the Context Component and as such have an active role in developing the Corporate IT Scenario(s) and the IT Positioning Statement. They have a directive role in developing the Target Environment Architecture and the IT management strategy and its Master Transition Plan.

Where systems development responsibility is decentralized to business units, this committee would retain a directive role for the architectures of the IT infrastructure, human resources and shared business systems only.

Typical of this committee's detailed tasks are:

Authorizing the business management, architectural and operational policies (Section 4.4.II.D.) proposed by the Joint Technical Planning Team.

Approving general levels of funding, arbitrating the overall priorities, and laying down general principles for cost allocation (Section 4.5.III.).

Reviewing the formulation, financial justification and progress of decision packets at the meta-architectural and the macro-architectural levels - i.e. the broad strategic thrusts of the management strategy (Section 4.5.II.).

Ensuring that appropriate strategic, architectural and operational controls are implemented and observed (Section 4.5.III.).

Managing second-order learning in the company (Section 4.1.II.D.3.), e.g. through the reformulation of the business vision for IT and its Target Environment Architecture.

Business Unit Steering Committees: These are senior managers and specialists in the owner and developer domains of a particular business unit. They have an active role in developing the Corporate IT Scenario(s) and IT Positioning Statement, insofar as their business units are concerned, and in defining the transition stages of their business units. They have a directive role in developing the architectures of their own business systems.

Detailed tasks of this committee include:

Assisting appropriately in all the tasks of the Corporate Steering Committee - in particular, ensuring that the IT Infrastructure and human resource plans stay in step with their own systems plans.

Reviewing the service and support provided by the centralized elements of the IT infrastructure and IT support organization.

Joint Technical Review Committee: These are technical managers and specialists drawn from all domains and business units. Their task is to support the Corporate and Business Unit Steering Committees in architectural, technical and organizational matters relating the formulation and implementation of IT strategy. They have an active role in defining architectures in response to IT Positioning Statement, and in formulating and carrying out the management strategy.

The concept of this committee is similar to that of the "General Technical Committee" described by Sloan:

> "Its most important role was that of a study group. It got to be known as a seminar. Its meetings usually were opened with the reading of one or two papers on a specific engineering problem or device, and these would then be the center of a general discussion. Sometimes the committee's discussion would conclude with the approval of a new device or method, or a recommendation on engineering policy and procedure, but more often the results were simply that information was transmitted from one to all." [Sloan, 1963: 125]

User Committees: These are persons with key roles in the user, developer and operator domains. Their task is to provide insight into the requirements of the people who are expected to work within the systems. Careful and sensitive handling of this task will help reduce much of the frustration and alienation, of which owners and developers are all too often unaware.

Along with the Joint Technical Planning team, this body makes recommendations to the Steering Committee, accepts assignments from it, and takes decisions on matters that can appropriately be handled without senior management intervention. It should also be capable of assisting in the technology evaluation processes (Sections 4.6.IV.B. and C.), particularly in respect of the man-machine interface [Galitz, 1980] and of individual and workgroup tasks.

There should be at least one User Committee per business unit.

2. The IT Support Organization

The idea of an "IT support organization" as the successor to the traditional DP department in the new perspective of systems thinking (Section 2.II.B.) comes from Benjamin [Course E-01: 6.], and its role as the organizational construct of the IT infrastructure was introduced in Section 4.4.II.B.5. The aim in this Section is to identify generic tasks of the strategic IT decision makers in the IT support organization.

The ITSO is, by definition, part of the IT domain of the company and its members will be employed in various IT functions throughout the organization - some as a central element, a part of the shared firm infrastructure, and some as integral elements of the business unit value chains [cf. Nolan, 1982: Chs. 3 & 4]. In this Study, however, only those tasks are considered that lie close to the interface between business and IT. As in the case of co-ordinating bodies (Section 4.4.V.C.1.), it is convenient to consider these tasks at an aggregate level.

Corporate Planning Staff and IT R&D Staff: Although not strictly speaking part of the IT support organization, the corporate planning staff have the crucial task of doing the environmental data analysis and documenting the Corporate IT Scenario(s) developed in the dialectical enquiry of the Context Component (Section 4.2.IV.).

They need to be supported by specialists from the IT domain, who, in a large enough organization, would ideally form a dedicated IT R&D function. Such an R&D function would also have tasks to carry out in managing the organizational learning systems for innovation and assimilation of technologies (Section 4.6.IV.B. and C.).

Architecture Staff: There are many ways in which one or more architecture staff departments in the IT domain can be aligned to the organization structure of the company. In companies where the IT functions are highly centralized, there may be just one such department covering all four dimensions of the target environment. In other companies, Old Mutual for example, one may find staff departments for infrastructure and for human resources in the central element of the IT support organization, and departments for the business systems architectures in the business units.

The major generic tasks of the architecture staff are to formulate the Target Environment Architecture, under the supervision of the Joint Technical Planning Team, and to assist in its incremental implementation.

Specific tasks that architecture staff departments can undertake include:

> Assisting the corporate planning and IT R&D staff in documenting the Corporate IT Scenario(s), especially with regard to impacts on strategic business system design (e.g. the implications of new operating systems for application systems design, or of object-oriented programming on workstation design).
>
> Assisting the application and database development personnel, partly by providing the user, systems and infrastructure interfaces that support incremental development (Section 4.4.IV.A.), and partly by lending their own expertise to difficult design tasks.

Benjamin, Rockart, Scott Morton & Wyman [1984: 7-9], Nolan, Norton & Company [Advanced Systems Inc., Course 3935: 29] and other writers advocate the appointment of a "Senior Technology Officer" or "Computing Functional Executive" to work alongside the traditional DP manager. Adopting a "hands-off style", the aim of this executive would be to create an internal planning environment in which managers in the owner domain can see IT as an important strategic weapon, and managers and specialists in the IT domain routinely address computing tasks as achievable through various technologies and approaches. In this Framework, the three major generic tasks of such an executive would be:

To supervise the customization of the Framework and the establishment of the strategic IT decision making process in the company. An important part of this activity would be to focus senior management attention on IT, since significant structural change will require senior management vision and direction.

To co-ordinate the IT strategy, i.e. the formulation of an IT technology strategy in terms of a Target Environment Architecture, and its incremental implementation in an IT management strategy (Section 4.3.V.). An important part of this activity would be to generate awareness throughout the organization of the potential advantages of IT at all levels of impact, since nothing significant will be achievable without the commitment of the individuals involved.

To control the organizational IT learning systems - for example, by ensuring that proposed adaptations of the IT strategy are mapped to the correct learning level (Figure 3) and hence are escalated to the appropriate co-ordinating body.

> Corporate steering committee - second order and double loop learning.
>
> Business unit steering committee - double loop learning.
>
> Joint technical planning team - double loop and single loop learning.
>
> User committee - single loop learning.

The core of the technology officer's mission is to ensure the free and informed discussion among competent decision makers, on which good organizational dialectic depends.

<u>IT Planning Staff</u>: Whereas the architectural staff focus on the infrastructure and systems dimensions of the technology strategy, planning staff focus on the human resources dimension and on the management strategy. The alignment of IT planning staff in the organization would normally parallel that of the architecture staff, and the two would cooperate closely.

Depending on the organizational environment and the skills of the available people, it may be convenient to separate planning staff into three groups, as follows:

> <u>Strategic Planning</u>: Establishing the decision making processes, co-ordinating the work of the various architectural teams, and administering the transition plans.
>
> <u>Human Resources</u>: Formulating and implementing the human resources architecture, and obtaining and developing the requisite personnel.
>
> <u>Financial Planning and Control</u>: Developing evaluation criteria and managing the financial justification and control processes. Computer capacity and performance management staff would provide important input to this activity.

There are many other roles at the technical levels of the IT support organization whose incumbents can perform useful supportive tasks in strategic IT decision making, e.g. hardware and software evaluation and acquisition, system programming, network planning, database management, and system quality assurance.

D. Strategic IT Decision Making Responsibilities

1. Charting the Responsibilities

Once the generic decision making roles and tasks have been mapped out, it is possible to identify, in general terms, what needs to be done, by whom, why, and subject to what constraints and difficulties.

> "... we need to understand how operating, administrative, and strategic decisions link together and what roles the different participants - operators, top and middle-line managers, technocratic and support staffers - play in the phases of the different decision processes." [Mintzberg, 1979: 61]

Figure 20, which is based on Figure 5 and the organizational development technique, "responsibility charting" [Beckhard & Harris, 1977: 77], is a simple device for mapping roles and tasks into generic decision making responsibilities. The earlier this charting is done the less chance there will be that the management strategy bogs down in role confusion and inter-personal conflicts about who is responsible for what - "mandate", "authority", "accountability" and so forth.

The rows of the chart are grouped according to generic decision making roles (Section 4.4.V.B.), and the columns according to generic tasks (Section 4.4.V.C.). With due regard for the level of participation and the communication factors (Sections 4.4.V.B.2. and 3.), a cell entry should provide:

A narrative description of the responsibility of the role for the task, if any.

An indication of the kind of responsibility:

<u>Initiation</u>: Initiate action and ensure completion.

Authorization: Approve/veto a course of action and allocate/deny the requisite resources.

Choice: Identify and recommend alternative courses of action.

Task: Carry out the work involved in implementing a decision.

Support: Provide technical, administrative or logistical advice and resource.

Inform: Inform or be informed about the implications of a decision.

The relevant decision making success criteria (Section 4.4.V.E.).

2. Strategic IT Decision Making Success Criteria

Figure 21 is is based on Figure 5 and Fosdick's [1985: 33] discussion of the need for quantification and measurement in information resource management. It shows examples of strategic IT decision making success criteria in each of the four domains. In practice, specific criteria will need to be mapped to each of the charted decision making responsibilities (Figure 20), and to the major inter-relationships between these responsibilities.

Decision making success criteria arise in the course of analyzing competitive advantage (the third box in the right-hand column of Figure 13). They are included in the human resources dimension because it is only with the competence and commitment of the people participating in it that strategic IT decision making can be successful. These success criteria are, therefore, personal measures that decision makers can use to evaluate themselves, individually and collectively, for the following reasons:

<u>Selection</u>: To choose among alternative proposals, or courses of action, for implementing the target environment. These criteria relate to the selection of thrusts for the transition plans, and they can thus be formulated in terms of decision packets (Section 4.5.II.) and the costs, benefits and risks they entail (Section 4.5.III.A.).

<u>Control</u>: To ensure that the current strategic thrusts and their action plans stay on track. These criteria would be used in co-ordinating and controlling the transition stages and in monitoring the realization of costs and benefits.

<u>Evaluation and Learning</u>: To determine whether and to what extent the strategic thrusts and plans have in fact been successful, and to provide feedback to the planning of future transition stages.

To be relevant in the context of this Framework, each indicator should measure one or more of the following properties of a proposed strategic thrust or action plan [cf. Bower, 1982(2): 632]:

<u>Effectiveness</u>: Contribution to competitive advantage - competitive position, organizational effectiveness and synergy (Section 4.3.IV.C.).

<u>Profitability</u>: (Eventual) impact on the costs, marketing, financial and other operating goals of the company.

<u>Acceptability</u>: Conformity with the social responsibility standards according to which the company operates [cf. Rowe, Mason & Dickel, 1986: Ch. 6].

Each box of Figure 21 shows two levels of criteria:

<u>Externally Valid Criteria</u>: These are of interest and use to the other three domains, or to the other two levels

within a domain. They refer to areas of common concern, such as competitive position, organizational effectiveness, executive performance appraisal, and service level agreements.

Internally Valid Criteria: These are of interest and use to decision making roles within a given level and domain. They refer to areas of domain concern, such as professional standards, quality improvement measurements, and internal installation management standards.

All of these criteria relate to the observable outcomes of decision making activity. Criteria relating to "input factors" - the knowledge, skills and attitudes of decision makers - would be found in the internal architecture. Nevertheless, specifying properties and indicators to measure them will depend to some extent on the roles and attitudes of the responsible decision makers. An online system, for example, may be deemed effective by a developers and users if it supports the right people, in the right way, and on the right scale, according to the system specifications. It will not, however, be deemed effective by operators and owners if these requirements are met at unacceptable levels of resource utilization and cost.

Hence, decision making success criteria are best defined in terms of inter-domain relationships. Six broad classes arise:

Owner-Developer: These refer to major projects for the development of IT infrastructure and strategic business systems. Specific indicators can be taken from the strategic and financial control processes of the IT management strategy (Sections 4.3.IV.C. and 4.5.III.A.).

Owner-Operator: These belong to the world of "service level agreements". They refer to the price-performance of the ongoing services offered by the IT infrastructure and business systems, in support of the "four automatable activities" - data processing, information processing, automated office functions and productivity tools (Section 4.4.II.A.).

<u>Owner</u>-<u>User</u>: These belong to the familiar world of personal performance appraisal. In the present context, the indicators refer to the successful use of the IT infrastructure and strategic business systems in meeting their strategic purposes.

<u>Developer</u>-<u>Operator</u>: These are similar to the owner-operator criteria, but refer specifically to information system design and development activities - computer aided software engineering (CASE) support, for example.

<u>Developer</u>-<u>User</u>: These refer to the requirements of people who will be expected to perform within the boundaries of the system - examples include productivity standards and man-machine interface standards.

<u>User</u>-<u>operator</u>: These also belong to the world of service level agreements, and refer to the ongoing support given to organizational effectiveness at each of the four levels of organizational impact (Section 4.3.III.A.).

A practical guideline in specifying indicators in each of the six categories is to consider the three Types of Link:

<u>Type</u> <u>I</u>: These suggest indicators of success in the organizational dialectic, as between the business and IT domains - for example, the level and cost of technical functionality needed to deliver service significantly better than the competition; the ranges of project lead times that are acceptable in meeting different kinds of market windows.

<u>Type</u> <u>II</u>: These suggest indicators referring to the

controllable interactions among different Components of the Framework - for example, legal and ethical norms constraining owners in the choice of competitive weapons; social, economic and technical constraints on developers' choice of appropriate technology in systems design.

Type III: These suggest indicators referring to organizational IT learning - for example, the rates of technology innovation and assimilation necessary to sustain competitive leadership in distribution channels or product/service performance leadership. These are essentially experience curve issues.

Useful tools and techniques for the development of decision making success criteria include the Critical Success Factors Technique [Bullen & Rockart, 1981; Rockart, 1979], and function points analysis [Albrecht, 1979, 1983(1), 1983(2); Albrecht & Gaffney, 1983; Behrens, 1983].

Useful guidelines can also be gleaned from an abundant literature on IT selection and evaluation criteria - for example, King, J.L. [1980], King & Schrems [1978], King W.R. [1978, 1983(1), 1983(2)], Klein & Beck [1981], Knight [1983]. Probably the most comprehensive treatment available to management is Boehm's [1981] "COCOMO" model.

E. The Internal Architecture

The tests for good organizational dialectic given in Section 4.4.V.A. make it clear that, for this Framework to be a useful aid in strategic IT decision making, the decision makers must indeed hold a reasonable number of contradictory assumptions to be challenged and synthesized. Assumptions, however, differ only because people see things differently, and this in turn is the result of differences in personal attributes - background, education, knowledge, skills, attitudes, styles and so forth.

Consequently, the aim of the internal architecture is to provide operational guidelines for acquiring, developing and retaining the requisite variety of people, and deploying them effectively as strategic IT decision makers in the roles and responsibilities mapped out by the external architecture. This aim includes the devising of incentive systems that simultaneously encourage the acceptance and attainment of decision making success criteria, and innovative, risk-taking attitudes. Such incentives will by no means be solely financial, as the research and recommendations of Cougar and Zawacki [1983] indicate.

Seen in this light, the human resource ideal for the target environment is to achieve congruency between IT purposes and uses, not by breeding a new species of DP manager, but rather by placing as many people as may be needed, with as great a variety of human attributes as can be obtained, into structured, participative decision making situations. Some of these people will be domain specialists, in either business or IT. Others will be multi-disciplinary generalists, responding not so much to the demands of a particular project as to generic needs - for example, organization and methods analysts with training in computer systems analysis and some fluency in mathematics and management accounting.

The problem, however, is that the available skill pool in South Africa is small enough to rule out the feasibility of many otherwise attractive IT strategies.

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4.5 DECISION MAKING PROCESS

I. IMPLEMENTING IT STRATEGY

This is the Component in which the decision making focus shifts from IT technology strategy (the formulation of the IT strategy as a target environment architecture) to IT management strategy (the incremental implementation of the architecture). Two broad classes of problem have to be addressed in the management strategy:

> Planning the implementation projects to take place, over time, in the context of the ongoing activities and relationships of organizational life.
>
> Ensuring that the various projects initiated to implement different aspects of the target environment architecture are well co-ordinated, and that they remain true to the overall architectural aims - for example, to the agreed purposes and uses of IT in the business strategy.

Just as the technology strategy may emphasize generic structures and processes that do not already exist in official organization charts, so too the management strategy may require decision making processes that are not already in place in the company. These are the kinds of change that introduce uncertainty into roles, tasks and responsibilities at all organizational levels - individuals, workgroups and business units - and people tend to resist them. Much confusion, demotivation and obstructiveness can be avoided if the changes are carefully planned, communicated and executed, with maximum participation of those most affected by them.

One way to do this is to treat IT strategy implementation as an exercise in company-wide organizational development [cf. Beckhard

& Harris, 1977]. Seen in this light, incremental implementation of the strategy can be structured as a series of organizational transition stages towards the shared vision of the target environment, and a considerable armoury of accepted "OD" insights and techniques becomes available to manage the transitions.

Similarly, the co-ordination and control of the implementation projects may require accounting concepts and practices that are not yet current in the company. In particular, it follows from the Framework's definitions of strategic business systems (Section 4.3.III.B.1.) and measurable competitive advantage (Section 4.3.IV.C.) that much emphasis will be placed on the aggregate costs and benefits of the whole IT strategy.

II. ORGANIZATIONAL DEVELOPMENT

The definition of company-wide organizational development given by Beckhard & Harris [1977: 2-3] can be adapted to become the definition of IT management strategy, as follows:

> IT management strategy is a planned, organization-wide effort, managed from the top, to increase organizational effectiveness and health through planned interventions in organizational structures and processes, using both information technology and behavioural science knowledge.

For a successful IT management strategy, the crucial element of this definition is "organizational health", and Beckhard & Harris [1977: 3-4] define it in a way that can be adapted to capture the central themes of this Framework (Section 1.I.):

> Organizational Adaptation: The organization as a whole as well as its significant sub-parts - individuals, workgroups and business units - manage the implementation of the IT strategy as a concerted effort towards agreed goals, objectives and ideals.

Form follows function, i.e. the tasks to be performed determine how a strategic business system (a human system with its supporting information system) is designed to support the people who will use it.

Both in the implementation of the IT strategy, and in the new organization structures it produces, decisions are made and tasks are performed by or near the internal sources of the relevant information, regardless of where these may be located in the current organization charts.

<u>Organizational</u> <u>Dialectic</u>: Every effort is made to ensure that communication, both lateral and vertical, remains undistorted. The tests for good dialectic suggested in Section 4.4.V.A. are based on the premise that people are generally open and confronting, and share all the relevant facts, including assumptions and feelings.

Good organizational dialectic helps reduce inappropriate win/lose activities among individuals and groups, through constant effort at all organizational levels to make problems subject to problem solving methods.

A high level of healthy contradiction (clash of ideas) relating to the ends of IT strategy and the architecture of the target environment is encouraged. At the same time, effort is made to keep the level of unproductive conflict (role confusion and personal clashes) as low as possible.

<u>Organizational</u> <u>Learning</u>: Individuals, work groups and business units see themselves as interacting with each other through organizational processes that can be improved, and with a larger environment through inter-organizational processes that can be controlled. In this way, the company is perceived and managed as an "open system".

There is a shared value of trying to help all individuals, work groups and individuals in the organization maintain their own integrity and uniqueness in a highly inter-dependent environment. Conversely, the "not invented here" syndrome is actively discouraged by the fostering of an attitude of wanting to achieve, more than simply wanting to do - and with the help of others wherever possible.

The reward system is such that decision makers are rewarded appropriately, in terms of their level of participation, for the achievement of short term goals and medium term objectives, for the development of their subordinates, and for creating viable work groups.

Decision makers at all levels in all domains operate in an "action-research" way, i.e. it becomes part of the general practice to build feedback and learning loops into control processes, so that individuals, work groups and business units can learn from their own and others' experience

These aims of organizational development are necessary conditions for an effective implementation of IT strategy, as envisaged in this Framework. If they do not already exist in the company, the effort to create them will have to be included as part of the management strategy. Useful conceptual frameworks for this purpose have been suggested in Section 4.3.V.B.

Beckhard & Harris [1977] describe how large-system change strategies can be carried out as a series of state changes. Their approach can be adapted to the needs of IT management strategy if incremental implementation is envisaged as a series of organizational transitions towards the target environment. The process can be summarized as follows :

Aggregate the activities that need to take place into meaningful "strategic thrusts", which can be scheduled as organizational transitions from one environmental state to the next on the road towards the ideal target environment.

Identify, link and sequence the short term action plans needed to give effect to each thrust.

Allocate the resources and expertise needed in each thrust, and acquire or develop them timeously for the action plans in which they will be used.

Identify the stakeholders in each thrust and action plan, i.e. the decision makers involved at each level in each domain (Section 4.4.V.B.), and obtain their commitment.

Map the roles, tasks and responsibilities (Section 4.4.V.), broadly per thrust and in greater detail per action plan.

Agree the timetables for the thrusts and action plans.

Identify, plan, and market to those concerned the changes that each thrust will require or produce in organizational processes and structures, as well as in all the managerial practices, procedures, rewards and policies that are affected. The Tichy [1983] and Miesing [1984] frameworks recommended in the Content and Organizational Learning Components are also useful for this set of activities.

Agree the bases for evaluating progress and achievement in each thrust and action plan.

Develop the knowledge, skills and attitudes needed in each domain, and at each level of participation, to enable stakeholders to manage the current transition stage, and to work in the new environmental state that will be its outcome.

III. TRANSITION STAGES

The basic concept in planning a transition stage is the "decision packet" (Section 4.1.II.C.). A transition stage represents the implementation of one or more decision packets, each with its own clearly defined contents, boundaries and interfaces.

A. Defining Strategic Thrusts

Figure 22 shows a fragment of a "Master Transition Plan", which sets out in broad terms how strategic thrusts are structured as decision packets spanning the dimensions of the Target Environment Architecture, and how they are are mapped into organizational transition stages. It will be noticed that there is an added fifth dimension in each strategic thrust, which represents the new or adapted strategic IT decision making responsibilities and processes that will be required.

Each cell of the Figure represents:

Those elements of the Target Environment Architecture chosen for implementation in that thrust.

The relevant Type I, II and III Links that will have to be managed (Section 4.1.II.B.).

It follows from the discussion of the three levels of architecture (Sections 4.1.III.D.3. and 4.4.I.) that the content, boundary and interfaces of a transition stage can be defined at each of these levels. It is indeed at this point that the levels of planning, architecture and implementation can be explicitly associated with planning timeframes (Section 4.1.III.A.):

Level of Planning	Planning Timeframe	Level of Architecture	Level of Implementation
Strategic	Long term	Meta-	Customization
Tactical	Medium term	Macro-	Instantiation
Operational	Short term	Micro-	Realization

Once the Framework has been customized for use in a given company, the entire Master Transition Plan should be complete (but adaptable) to at least the meta-architectural level. Transition stages scheduled to commence within the medium term should reach at least the macro-architectural level of detail within that timeframe. Finally, the current transition stage or a transition stage scheduled to commence in the short term should reach the micro-architectural level in that timeframe.

It will, of course, be necessary for decision makers to define precisely what they mean by the "commencement" and indeed the "end" of a transition stage. A rough rule of thumb is that a transition stage begins with the work involved in formulating the micro-architecture, proceeds through human and information systems development and implementation, and ends when the new environmental state is realized.

The B+OL+D methodology [Benjamin, Seminar E-01] recommends two parallel sets of strategies:

> "Management" strategies expressed in terms of the external architecture.
>
> "Technical" strategies expressed in terms of the internal architecture.

Experience at Old Mutual indicates, however, that many people will have difficulty, firstly in understanding the logical difference between the two sets, and secondly in mapping the one set to the other when validating implementation plans.

The present Framework proposes just one IT management strategy, to implement just one IT technology strategy. Referring to Figure 23 (and ignoring the controls for the moment), it will be seen that at the meta- and macro-architectural levels the thrusts and plans of the IT management strategy are couched in the terminology of the external architecture. They can thus be understood by decision makers at all levels of participation in all domains. Details relevant to the internal architecture can be provided in separate documentation for those who require them.

At the micro-architectural level, however, action plans are set out in the implementation-orientated terminology of the internal architecture. It should not be necessary to document details of the external micro-architecture, if the features, functions and options of the IT infrastructure and business systems are well-designed and prototyped.

Returning to Figure 22, it will be seen that the thrusts of a company's IT management strategy can be developed by following first the columns of the Chart, then the rows. A "sub-strategy" can be identified with each column:

A company-wide IT infrastructure strategy.

A human systems strategy and an information systems strategy for each business unit.

A company-wide human resources strategy.

A strategy for creating the decision making processes the IT management strategy itself requires.

Each of these sub-strategies can be further subdivided into any number of more specific sub-strategies, for example, a telecommunications strategy, a mainframe strategy, a data management strategy, an office automation strategy, and so on. Each of these can broken down into a number of development stages. The "technical strategies" referred to in Figure 9 emerge in this way.

The activities and development stages thus identified may then be re-grouped into thrusts (rows), taking into account technical and business priorities, and inter-dependencies among the strategies

- for example, ensuring that infrastructure and human resource development stages keep at least abreast of application development requirements.

The thrusts can then be mapped into transition stages.

B. <u>The Medium Term: Tactical Plans</u>

The objective of a medium-term (e.g. 3-year) tactical plan is to accomplish an organizational transition stage. It consists of one or more strategic thrusts aimed at bringing some portion of the Target Environment Architecture into reality. Special decision making roles may be necessary if the transition state is unique or different from either the pre-change or post-change scenario, e.g. a stage manager, or a product/process "champion" with sufficient power skills (Section 4.6.IV.B.) to see that difficult changes go through successfully [cf. Beckhard & Harris, 1977: 45].

A tactical plan is set out in two parts - a process plan and a commitment plan. Although these relate to the level of the macro-architecture, and their details are thus beyond the scope of this Study, the following two Sections offer some explanation of what they comprise.

1. Process Plans

The word "process" is used intentionally. Firstly, it highlights the fact that every strategic thrust and transition stage is to be managed as a total process of change [Beckhard & Harris, 1977: 51], and not as a number of more or less autonomous projects that require synchronizing. Secondly, it suggests that the boundaries of a tactical plan should follow those of the generic organizational processes involved, to ensure a feasible scale of change and careful interfacing with the parts of the organization that are not included in the transition. Moreover, a transition stage that is restricted to a well-defined subset of the value chain facilitates calculation of the benefit (i.e. competitive advantage) expected.

In essence, the process plan is a road map for the change effort, which contains the following elements:

Stakeholders: The strategic IT decision makers involved in this transition stage, at all levels of participation in all domains.

Transition Scenarios: Delineations of those parts of the internal environment and inter-organizational relationships that will be affected by the transition stage - their present state, their intended state at the end of the stage, and the changes needed to get from the former to the latter.

Projects and Resources: An outline of the technical and organizational projects that will be mounted over the period concerned to bring about the needed changes, their timeframes and priorities, and the resources that will be allocated to them.

Education and Marketing: The requisite technical and organizational knowledge that must be imparted to all the stakeholders, including demos and other marketing materials.

A good process plan will have the following characteristics [Beckhard & Harris, 1977: 51-52]:

Purposeful: All activities are clearly linked to the transition stage objectives and priorities.

Feasible: The transition is not too big to be managed effectively with the resources available to the company.

<u>Task-specific</u>: The types of activity are precisely identified rather than broadly generalized and are clearly mapped to the stakeholders, in a responsibility chart, together with agreed decision making success criteria (Section 4.4.V.D.).

<u>Integrated</u>: All activities arise out of the Master Transition Plan (Figure 22), and are explicitly inter-linked in suitable statements of assumptions and dependencies in the project documentation

<u>Temporal</u>: The plan is time-sequenced, and can be controlled by critical path scheduling methods.

<u>Adaptive</u>: The plan is capable of adaptation through the organizational IT learning loops (Section 4.1.III.D.3.; Figure 3), and there are also contingency plans for major disruptions (Section 4.5.II.D.).

<u>Agreed</u>: The plan is agreed by all its stakeholders, starting with the chief executive officer of the company.

<u>Cost-effective</u>: The plan is properly evaluated (Section 4.5.III.A.), and justified in terms of its contribution to competitive advantage (Section 4.3.II.C.).

2. Commitment Plans

Experience shows, according to Beckhard & Harris [1977: 52-53], that in addition to developing the plan for carrying out changes, it is also necessary to determine key persons among the stakeholders who <u>must</u> be committed to these changes if they are actually to take place.

This is in part a political problem, the "P" strand in Tichy's [1983] T,P,C Theory. Moreover, experience strongly indicates that in any complex change process there is, for every subsystem affected, a critical mass of people whose commitment is necessary to generate the energy for the change to occur. There is also, of course, also a threshold beyond which too many commitments would be required to enable the transition to be managed effectively. Hence a commitment plan sets what may be termed the lower and upper political bounds to the scale of the transition.

A commitment plan, therefore, is that part of a strategic thrust aimed at securing the support of key persons involved in the generic processes covered by the transition stage, as well as key supportive persons in other parts of the organization. Such persons will be identified for much the same personal attributes as those found in "corporate innovators" - power skills, an ability to resolve the dilemmas of participative decision making, and insight into the architecture and implementation of culture and strategy change (Section 4.6.IV.B.).

Beckhard & Harris [1977: 54 - 57] provide guidelines for setting up a commitment plan.

C. <u>The Short Term: Action Plans</u>

To accomplish a strategic thrust, the process and commitment plans must be translated into a number of action plans, which will be included in the ordinary business and IT planning processes of the company. Action plans to change the human systems should be included in the business plans of the relevant business units, and be explicitly linked to the competitive strategy purposes they are meant to serve.

The corresponding IT infrastructure, information systems and human resource action plans should similarly be included in the relevant business plans, capacity plans, technical plans and so forth of the IT support organization.

This the only level at which resources are actually acquired, and elements of the target environment are actually created. It is, therefore, the principal level at which errors and the conditions for error in the IT strategy will be detected, and consequently the action plans should be drawn up, executed and controlled within the context of effective organizational IT learning systems (Section 4.6.IV.).

D. Contingency Plans

These are company-wide plans that do not directly contribute to progress towards the target environment, but are essential to ensure the survival of an IT-dependent company and the viability of its IT strategy. Examples are:

Supplier Policies: These are rules for selecting all types of technology supplier - hardware; software; technical support and consultancy; programming and other contractors - and for conducting ongoing relationships with them. Broadly, they indicate the extent to which the company wishes to be committed to any one supplier, and what it will do if for any reason a supplier fails to meet its commitments to the company.

Security Plans: These are rules, procedures and structures to protect the company's data, systems and equipment from unauthorized access, physical as well as logical; damage, whether malicious or accidental; and loss of competitive advantage, e.g. through unauthorized access to design details.

An important aspect of these plans is the protection of the confidentiality/secrecy of the IT strategy itself. This will include security-related criteria for the selection of participants in the strategic IT decision making processes, constraints on which parts of the strategy may be documented in writing and on who may have access to the documents, and measures to protect the confidentiality of development projects and the company's ownership of the systems and programs produced.

Disaster Recovery Plans: These are rules, procedures and structures to protect the company's data, systems and equipment from partial or complete disaster, and for recovery from such disasters should they occur.

IV. CO-ORDINATION AND CONTROL

Co-ordination and control of the IT management strategy in the aggregate, as it unfolds incrementally and adaptively, will be required along three axes:

Logical: To maintain the integrity of the plans down through the levels of implementation - customization, instantiation and realization - and up through the levels of organizational IT learning - single-loop, double-loop and second-order (Figures 3 and 14).

Temporal: To maintain the integrity of the plans as a transition stage is implemented, and from stage to stage (Figure 22).

Organizational: To maintain the integrity of the plans across all the decision making levels and domains (Figures 19, 20 and 21), and to ensure that new generic structures and processes are realized with minimal distortion by the pressures of vested interests in current organizational forms (Figures 15 to 18).

The specific elements that need to be controlled will become apparent as the decision packets constituting the strategic thrusts are built up from the Components, Parts and Links of the Framework. They fall into the three classes shown in Figure 23:

Strategic Controls: These monitor the IT strategy as a whole, through a stage and from stage to stage, to ensure that all the Parts are co-ordinated, and that all action plans remain true to the agreed purposes and uses of IT. If adaptation is required in the IT technology strategy _per se_ (the IT Positioning Statement and the Target Environment Architecture), either double-loop or second-order learning would be taking place.

Architectural Controls: These ensure that action plans remain true to the medium-term objectives of the current transition stage, and are consistent with those elements of the Target Environment Architecture that have already been instantiated. If adaptation can be contained at this level, single-loop learning would be taking place.

Operational Controls: These ensure that the action plans and resource allocations are correctly inter-related, that they remain true to the requirements of the process and commitment plans, and that operators and users get the service they can legitimately expect from the systems delivered. If adaptation is confined to the macro- and micro-architecture levels, then single-loop learning would be taking place.

The two major kinds of benefit measurement that support the co-ordination and control of IT strategy in the aggregate have already been introduced, in the Content and Structure Components of the Framework:

Competitive Advantage: (Section 4.3.IV.C.) These measures support strategic control of the Master Transition Plan and the tactical and action plans.

Decision Making Success Criteria: (Section 4.4.V.D.2.) These measures are related to the strategic control measures, but because they are domain-specific they are particularly useful in architectural and operational control.

There is an extensive literature covering various kinds of cost and risk measurement that support the co-ordination and control of IT strategy. Useful ideas can be obtained, for example, from Boehm [1981], Goldberg & Lorin [1982], Inmon [1983], International Business Machines [1983: Vol. IV], Nolan [1977], Nolan [1982: Part 4], and Norton & Rau [1977].

The following Sections describe some of the ways in which costs and risks can be calculated and aggregated, with particular reference to the different kinds of benefit (i.e. competitive advantage - Section 4.3.IV.C.) and the different kinds of decision making responsibilities.

A. <u>Costs, Benefits and Risk</u>

Two useful frames of reference are provided by:

The "Four-Category Resource Budgeting" model of the B+OL+D methodology [Benjamin, Seminar E-01, Section 5-2].

"Enterprise-wide Information Economics" (EwIE), a subset of Enterprise-wide Information Management (EwIM) [Benson & Parker, 1986(2)].

In the following Sections, these are synthesized and adapted to the concepts of IT infrastructure, strategic business systems, competitive advantage and decision making success criteria, as defined in the present Framework.

1. Aggregate Classes of Strategic IT Costs

There are two broad classes of strategic IT costs:

<u>IT Infrastructure</u>: The cost of all resources - the basic hardware, software, services and human skills - required to provide or extend the IT infrastructure in readiness for the strategic business systems that will depend on it.

Strategic Business Systems: The cost of all resources - the system-specific hardware, software, services and human skills - required to provide both the human systems part and the information systems part of a strategic business system (Section 4.3.III.B.1.).

In each class, total costs can be analyzed as follows:

Development Costs: The "up-front" costs of developing and implementing new IT infrastructure and strategic business systems, or of adapting existing infrastructure and systems in response to double-loop or second-order organizational IT learning.

Operational Costs: The ongoing running and maintenance costs of the IT infrastructure and strategic business systems after they have been implemented. Such costs will increase over time, as a result of growth in the volume of transactions supported by the business systems, maintenance and adaptation arising out of single-loop organizational IT learning, equipment obsolescence, inflation, and so on.

Operational costs must be separated into the "existing" costs of those parts of the Target Environment Architecture that have already been realized, and the "prospective" costs of the systems and IT infrastructure yet to be realized.

Incremental Costs: The development costs plus the discounted present value of the prospective operational costs, in respect of a proposed strategic business system or extension to the IT infrastructure.

Transition Costs: The aggregate of all incremental costs pertaining to the strategic thrust(s) of a transition stage. In this Framework, "strategic IT costs" are defined to be the transition costs. The activity involved in customizing the Framework and preparing the first release of the Master Transition Plan should be included in the first transition stage.

Since each transition stage is a total process of change with a self-consistent and workable environmental state at the end of it, management always has the option to suspend the IT management strategy at the end of any stage. Hence total strategic IT costs are always determinate and manageable - they are the current transition costs.

By analogy with Benjamin's [Seminar E-01, Section 5-2] model, transition costs can be further analyzed as follows:

"WED" (Workstation Environment Development): The costs of implementing or adapting the four physical constructs of the infrastructure - virtual workstation, virtual network, virtual applications portfolio, and virtual data model (Section 4.4.II.B.1. to 4. and Figure 15).

"USE" (User Services Environment): The costs of implementing adapting the information technology support organization (Section 4.4.II.B.5. and Figure 15). The costs of developing human resources and strategic management processes would be included here.

"STRAD" (Strategic Application Development): The costs of implementing or adapting strategic business systems, or of converting existing business systems to become part of the strategic portfolio (Section 4.4.IV.B. and Figure 18).

In this Framework, Benjamin's "WAR" (Work as Required) can be interpreted as a balancing item representing the difference between transition costs and the total IT budget.

Another perspective on transition costs, which links them more clearly to kinds of benefit, is obtained in terms of Benson &

Parker's [1986(2): 3-4] framework:

> <u>Substitutive Applications</u>: These applications (i.e. IT infrastructure as well as strategic business systems) are intended to reconfigure the value chain by substituting new generic processes for existing processes that are less information-intensive and less efficient. Either existing costs are replaced, or potential new costs are avoided. These applications often, but do not always, entail the replacement of human labour by relatively less expensive machine power.
>
> <u>Complementary Applications</u>: These applications aim at increasing the effectiveness of generic processes, either by enhancing the productivity of individuals and workgroups, or by increasing the efficiency of support activities and linkages (external as well as internal) in the value chain.
>
> <u>Innovative Applications</u>: These applications aim at gaining or maintaining some unique competitive advantage, and are typical of impact IT strategy. They achieve their uniqueness through radical changes in processes and/or products, and frequently involve inter-organizational links. Much detailed risk analysis may be required.
>
> > "Potential benefits are high, but the measurement approaches are speculative, due to the nature of creating entry barriers and the risk of [not] being both first and right." [Benson & Parker, 1986(2): 4]

Figure 24 shows nine aggregate classes of strategic IT costs, which result from the Benjamin and EwIM categories. If desired, each box could be further subdivided in any of a variety of ways as suggested by the constructs of each dimension of the Target Environment Architecture. The purpose of such a grid is to help not only in keeping track of where the money is going but also in identifying the kinds of benefit to be expected, and hence the kinds of evaluation technique that are appropriate in different circumstances.

2. Evaluation Techniques

It is consistent with the principle of directed incrementalism (Section 4.2.IV.B.3.), and with the definition of total strategic IT costs as the current transition costs (Section 4.5.III.A.1.), that evaluation of strategic benefits and risks should only be attempted per transition stage.

Benson & Parker [1986(2): 4-8] identify five kinds of evaluation technique which can be used to calculate the benefit (measurable competitive advantage - Section 4.3.IV.C. and Figure 13) and risk corresponding to different aggregate classes of transition costs:

> Traditional Cost-Benefit Analysis: These techniques arise out of financial management theory and deal with direct and tangible benefits, such as cost avoidance. They are most useful in the "Substitutive" column of Figure 24, but they can be adapted to "Complementary" systems - for example, IBM Canada's [1983, 1986] "EP/DP (Executive Planning for Data Processing" technique, which attempts to quantify the "value of data processing" in terms of the "equivalent headcount" replaced or avoided.
>
> Since, in general, these techniques are best suited to small, piecemeal costs charged directly to a specific project, value activity or product, they are best applied independently, as required, in each of the three boxes of the "Substitutive" column. The results of all the analyses can then be added to get the aggregate costs and benefits.
>
> Architecture-Based Cost-Benefit Analysis: These techniques [Parker, 1982(1); 1982(2)] are suited to comprehensive proposals with large up-front commitments, such as total

transition costs. They can be applied to the aggregate evaluation of all three boxes in the "Substitutive" column of Figure 24.

<u>Indirect</u> <u>Cost</u>-<u>Benefit</u> <u>Analysis</u>: The basic assumption of these techniques is that, because a job or a process continues to exist in an organization, it must contribute in some measurable way to a value chain, and that this "imputed value" can be calculated. Such techniques are needed when the benefit lies, not in the capacity to substitute computer power for routine labour, but rather in shortening the time needed to accomplish a given task, or in allowing more of a given task to be done in the same amount of time, or in allowing the restructuring of work [Sassone & Schwarz, 1986: 83].

Drawing on the microeconomic theory of the firm and the theory of linear programming, Sassone & Schwarz have developed a "hedonic model" that can be used to investigate the value of the components of a good or service, or the contribution of a value activity.

> "... we recognize that jobs are not monolithic, but have identifiable components with different implicit values. For example, a manager's job may involve managerial, professional, technical, administrative and clerical components. We express these components in a work profile ... By using the hedonic model to explain the value of the job (salary plus fringe benefits plus direct overhead) in terms of the amounts of each component the job entails, we can draw inferences about the implicit value of each component." [Sassone & Schwarz, 1986: 86]

Since IT permits changes in the composition of a work profile - the configuration of a job, a generic process or a value chain - the implicit, or hedonic, values can be used to place a monetary value on that change, and hence on the IT application itself.

Benefit Acceleration Model Analysis: Such techniques, as described by Benson & Parker [1986(2): 6-7], assess the costs of a proposal against the speeding up it will achieve in the rate of accrual of relevant benefits. Although it does not appear to be as general as the hedonic model, a benefit acceleration model could be used to justify the IT applications in certain cases, e.g. where the impact of the change, say new programming support facilities, is to reduce the "applications backlog".

Innovation Risk Analysis: This kind of analysis is appropriate for the "Innovation" column of Figure 24. It would be used

> "when the financial issues move from those of measurement to those of evaluating and choosing alternatives. It is useful for new, unprecedented applications of information technology, and takes into consideration the value/benefit of gaining/maintaining competitive advantage; the risk/cost of being first; and the risk/cost of failure. It can be applied to any function of the enterprise value chain." [Benson & Parker, 1986(2): 7-8].

There is a growing literature on new-venture risk analysis, and Benson & Parker cite several sources.

B. Domain Accountability

The management accounting processes of the company have to be brought into play in the IT management strategy in order to generate the data needed for the cost, benefit and risk evaluations described in the previous Section. A second and equally important function for these accounting processes is to facilitate management of the accountability that accompanies responsibility in participative strategic IT decision making.

Each decision making domain is accountable in some way to every other domain. These relationships will be in respect of budgeted as well as actual costs and benefits. The following list is not intended to be exhaustive, and shows only the main relationships.

Stage and Project Justification: Using the cost, benefit and risk evaluations described in the preceding Section, transition costs can be analyzed and managed in terms of the strategic purposes and uses envisaged in the medium-term transition plans. The output of this analysis would constitute an "IT business plan" for the transition stage, prepared for the owners by the developers of the transition plans.

Capacity and Service Commitment: The IT business plan must be accompanied by an appropriate and specific commitment of resources to the users who, working within the envisaged system, are expected to make the plan happen. Acting on the owners' behalf, the developers are in a position to set out these commitments in terms of requisite capacity, functionality and service levels.

Capacity and Service Delivered: As implementation unfolds, it is necessary for the operators to monitor the capacity and service levels actually delivered to users. This is an important part of the user, architectural and strategic controls arising out of the action plans (Figure 23).

Strategic IT Cost Allocation: Transition costs will have been presented in terms of strategic purposes and uses and generic processes, in the IT business plan for the stage. It is also necessary for them to be translated into whatever conventional Business/IT expense categories have been agreed, for allocation against the profit centres responsible for them. Both the budgets and the actual costs and variances should, of course, be reconciled to the IT business plan.

Expenditure Accounting: Similarly, it is necessary for transition costs to be analyzed in terms of conventional IT management categories. This permits developers to monitor, on behalf of the owners, usage, price and efficiency variances according to different human and technical resource categories. This process should also include the monitoring of technology and resource acquisition plans and the contingency plans.

Responsibility Accounting: This is the analysis of transition costs according to the responsible departments in the official organization chart rather than generic processes in the value chain. Managers and supervisors receive budgets for those elements of transition costs that pertain to their departments, and over which they have direct (or shared) control. Transition costs, of course, include the up-front development costs as well as the prospective operating costs, so that users become accountable for the ongoing operation of the infrastructure and business systems as well as their proper development. In this way they become the agents of the owners, not merely the creatures of the system.

oooOooo

4.6 ORGANIZATIONAL IT LEARNING

I. DEVELOPING THE IT CAPABILITY

Achieving congruency in the development of a company's strategic IT capability, as envisaged in this Framework (Section 4.2.I.; Figure 4), requires two complementary learning processes.

On the one hand, there must be some practical way in which the organization, as an entity with an existence that continues beyond the incumbency of its current decision makers, can be made to accumulate experience and skills in formulating, implementing and adapting IT strategy [cf. Shrivastava, 1983: 14]. From this point of view, organizational IT learning can be seen as the process through which a company develops distinctive competences in deploying IT resources - in specific competitive strategies, by exploiting the effects of IT on generic strategies (Section 4.3.II.B.), and in specific organizational designs, by exploiting the effects of IT on generic structures and processes (Section 4.3.III.B.).

On the other hand, incumbent IT decision makers acting as the learning agents of the organization must: (a) recognize and respond to situations where learning can and should take place [cf. Argyris & Schön, 1978: 29]; (b) themselves become adept, individually and collectively, in making strategic IT decisions; and (c) give effect to the corporate accumulation of skills and experience. IT learning is triggered when decision makers respond to "errors" in their evolving tactical and action plans, which arise not only because of mistakes in the IT strategy, or in its implementation to date, but also because technological and other changes in the external and internal environment invalidate the original assumptions.

From both points of view, learning becomes organizational when "learning systems" are in place to record what individuals have learned in "shared images and maps" [Argyris & Schön, 1978: 16-17]. The aim of this Component of the Framework is to assist in the conscious design and building of formal learning systems, through which individual and organizational IT learning will be perpetuated and institutionalized in the company [Shrivastava, 1983: 7]. The learning systems are intended to produce, maintain and adapt, on an ongoing basis, the five explicit sets of shared images and maps shown in Figure 2:

The Corporate IT Scenario,
The IT Positioning Statement,
The Target Environment Architecture,
The Master Transition Plan, and
The Learning Systems themselves.

It may be noted in passing that the very process of applying IT is itself a powerful means of developing decision making competence in all four domains (owner, user, developer and operator), through the systematic thinking it demands of decision makers and through the ability of the technology itself to widen the bounds of decision makers' abilities (Section 4.3.III.B.; Bakopoulos & Treacy [1985: 4-7]). This "accelerator" effect is a major reason why modern information engineering tools for software development are so powerful [Martin, 1986].

II. PERSPECTIVES OF ORGANIZATIONAL LEARNING

Five principal "organizational disciplines" emerge as the subject areas of organizational learning. They permeate all Parts of the Framework, but are focused in the Components indicated below:

Organizational Dialectic: This is both a discipline and a process in this Framework, and its focus is on the dialectical enquiry of the Context Component.

Organizational Policy: This is the overall theory and practice of business strategy, which covers corporate strategy, competitive strategy and organizational design. Its focus is on the strategic option generator of the Content Component.

Organizational Design: This is that part of organizational policy which can be expanded as a set of architectures for IT infrastructure, human systems, information systems and human resource development. Its focus is on the Target Environment Architecture of the Structure Component.

Organizational Development: This is a body of behavioural science theory and techniques, supporting the orderly transformation of the organization through the planned transition stages. It is itself a dialectical process, in that new kinds of IT and applications expose underlying generic organizational structures and bring them into contradiction with the existing official forms. Its focus is on the transition plans of the Process Component.

Organizational Learning: This too is both a discipline and a process in the present Framework, and its focus is on the learning systems of this Component. Organizational IT Learning is itself an area for (second-order) learning because IT strategy challenges management to rethink, and to learn how to rethink, the nature of the business, the mission of the company, and the role of the technology. Part of the effort will be to dispel the illusion that innovation is always something imported from outside the company. Every adaptation of strategy, organization or plans, however wide or limited the scope of the change, represents both innovation and organizational learning.

Although there are as yet no rigorous theories of organizational learning, four distinct and contrasting perspectives have been identified by Shrivastava [1983: 9-16], which help in identifying the organizational IT learning systems a company will require. Shrivastava's descriptions of the four perspectives are summarized in the following Sections.

A. <u>Adaptive Behaviour</u>

In this perspective, organizational learning is seen as the adaptive behaviour organizations exhibit over time, in three different aspects of strategic decision making:

<u>Adaptation of Ends</u>: Organizations change their planning ends (ideals, objectives and goals) on the basis of their own and others' experience.

<u>Adaptation in Attention Rules</u>: Organizations change the rules by which they selectively attend to some parts of their environment and ignore others.

<u>Adaptation in Search Rules</u>: Organizations change their criteria for selecting strategies and evaluating success, in the light of their previous successes and failures.

Individual learning becomes organizational through interactions that occur among individuals and organizational subgroups - workgroups, business units, and the company as a whole. These interactions result in two kinds of stress, which stimulate learning:

<u>Performance Stress</u>: This occurs when there is a gap between the goals people strive for and the results they achieve. For example, Ansoff, DeClerck & Hayes [1976: 42] note that the competitive mode of strategic behaviour (Section 4.3.II.B.2.) is "profit producing" while the entrepreneurial mode is "profit absorbing", and that a firm is likely to gravitate towards the former so long as it thinks the potential of its existing markets is adequate for its growth and profit objectives. In such a company,

impact IT strategy, with its focus on improved potential for future success rather than on immediate success, is likely to generate performance stresses.

<u>Disjunctive</u> <u>Stress</u>: This arises out of contradictions among means, ways and ends (Section 4.2.IV.B.1.), and conflict among individuals and subgroups. For example, a given transition plan may represent an alignment IT strategy for some parts of the organization but an impact strategy for other parts, thus calling for different managerial and technical responses. "Different parts of the firm should have different ... capabilities, depending on whether their mission is to support competitive or entrepreneurial activities" [Ansoff, DeClerck & Hayes, 1976: 65].

Organizational learning occurs through individual, subgroup and company-wide adaptation to the contradictions and conflicts caused by these stresses.

In general, the rows and boxes of the strategic option generator (Figure 11) are highly interdependent: the choice of strategic target strongly influences, and is strongly influenced by, the choice of generic strategy, and so on through the choices of mode, level of use, class of use and competitive advantage aimed at. While a poorly balanced set of choices will produce an infeasible or extremely difficult strategy, a reasonably but not ideally balanced set of choices should be expected to generate the performance and disjunctive stresses that prompt adaptive learning. Everything, however, depends on the decision makers, who may

> "lack the motivation, the skills and the risk propensities not only to plan but to follow planning with appropriate actions. The system and the structure [may be] geared for competitive activities and not capable of rapid entrepreneurial response. The available information [may

> be] totally inadequate for generating the needed strategic alternatives. The reward and value system [may] actually punish, rather than reward, entrepreneurial risk tactics."
> [Ansoff, DeClerck & Hayes, 1976: 48]

The differences between the kinds of strategic challenge, organizational response and management attitude associated with the two strategic modes, which exemplify the kinds of issue that have to be addressed in adaptive learning systems, are summarized by Ansoff, DeClerck & Hayes [1976: Tables 1, 2 and 3].

It should be noted that the term "entrepreneurial" is used in three quite different senses in this Framework:

> The entrepreneurial mode as contrasted with the competitive mode, in the sense of strategic posture discussed in the Content Component (Section 4.3.II.B.2.).
>
> The entrepreneurial competence of decision makers as contrasted with administrative competence, in the sense of organizational capability discussed in the Context Component (Section 4.2.I.).
>
> The corporate "entrepreneurial spirit", a synonym for intra-organizational innovation in the sense used by Kanter (Section 4.6.IV.B.).

These differences of usage need not problematical. They underline the organizational (i.e. participative/collaborative) character of successful strategic IT decision making. Kept clearly in mind, they can lead to fruitful debate of congruities and contradictions as amongst strategic posture, distinctive competence and organizational climate. Kanter found in the companies she studied that

> "there are marked differences in how much the entrepreneurial spirit flourishes in different

environments. ... There are almost twice as many well-regarded managers and professionals in any functional area carrying out innovative projects in firms characterized by integrative practices as in those exhibiting too much segmentalism ... The environment more than the person makes the biggest difference in the level of innovative managerial activity. Individual differences play a role only when the company's environment discourages initiative and innovation." [Kanter, 1983: 211]

B. Developing a Knowledge Base

In this perspective, the organization is seen as a system of purposeful activities engaged in co-ordinated transformation processes (i.e. production functions or value chains) that turn sets of inputs into outputs. The success of the organization - competitive position, organizational effectiveness and congruency (Section 4.3.IV.C.) - is a function of its long-term directional choices, its choices of transformation processes, and its supporting administrative structures. Rational choices are based on prior knowledge about the relationships between organizational actions and outcomes, and hence success is qualified by the knowledge available to the organization for making crucial choices.

Learning becomes organizational when knowledge about the action-outcome relationships and the factors that affect them - indeed, the context, content, structure, process and learning components of strategic decisions - induces relatively permanent changes in individual and sub-group behaviours, across the entire organization. The required organizational IT learning systems must, therefore, contribute to the company-wide knowledge base that makes these changes feasible.

The five explicit sets of shared images and maps constitute precisely such a knowledge base. Through them, knowledge is distributed across the organization, is communicable among decision makers, has consensual validity, is incremental, and is integrated into the generic processes and administrative structures of the organization.

C. Institutionalized Experience

This view of organizational learning is based on the theory of learning curve effects, and its generalization by the Boston Consulting Group into the theory of experience curves [Robinson, 1986: Ch. 9]. The importance of learning curve and experience curve effects in other parts of the Framework has already been noted - in creating sustainable competitive advantage (Section 4.3.II.B.2.), in IT positioning (Section 4.3.IV.A.), and in the creation of operating synergy (Section 4.3.IV.C.).

The strategic IT decision makers gain vital knowledge and experience through their participation in successive cycles of dialectical debate, through their work in formulating IT scenarios, positioning statements and architectures, and through formulating and implementing strategic thrusts and transition plans. The competence they gain in any given transition stage positions them, as a group, to plan and carry out future stages better. The crucial point is that the gain be collective - that it represent better organizational knowledge and anticipation of the environment, both internal and external, better understanding and utilization of the generic processes of the organization, and a growing ability to overcome resistance to change in official organizational structures.

It follows that important requirements of the learning systems, if individual learning is to become organizational, are:

> That the competence gained be relevant and transferable across different groups of decision makers in the company, and over time.

> That there be a means of evaluating the cumulative gain at

any point in time, so that transition stages will not be attempted that require competences the organization does not yet possess.

That there be a means of minimizing the attrition of competences through inappropriate career development of critical decision makers or their avoidable departure from the company.

D. Assumption Sharing

Since this is the main perspective of organizational learning underpinning this Framework, and it is referred to many times in the other Components, its general definition is given in the organizational learning entry in the Glossary (Appendix C). Three levels of learning are shown in Figure 3 and discussed in Section 4.1.III.D.3. - single-loop, double-loop, and second-order learning. The latter two are the levels at which IT learning becomes effectively organizational.

Most organizations contain what Argyris & Schön [1978: Ch. 5] call "Model O-I limited learning systems", and these inhibit double-loop and second-order learning through the kinds of "action strategies" induced by their governing variables. The three governing variables of Model O-I learning systems are: "Define goals and try to achieve them"; "Maximize winning and minimize losing; "Minimize generating or expressing negative feelings". Typical of the inhibitory action strategies they engender are:

Design and manage the environment unilaterally - instead of arguing your case logically, appeal persuasively to higher order goals.

Own and control the task - be the guardian of its definition and execution.

Unilaterally protect yourself - speak in inferred categories accompanied by little or no data; reduce incongruity by defensive actions such as blaming, stereotyping, suppressing feelings, intellectualizing.

Unilaterally protect others from being hurt - withhold or censor information, hold private meetings.

Double-loop and second-order learning require what Argyris & Schön [1978: Part III] call "Model O-II learning systems".

"If we are interested in overcoming the forces that inhibit double-loop learning, we must seek another learning system. But if our assertion that most organizations contain O-I learning systems is valid, and if Model O-I learning systems deter the creation of new learning systems that run counter to their basic structure, then the new learning system is not likely to be found by looking at the world as it presently exists. The creation of Model-II will therefore have to be a rare event. Rare events cannot be created without a map that describes the new territory." [Argyris & Schön, 1978: 130]

The three governing variables of Model-II learning systems are [Argyris & Schön, 1978: 137]: "Valid information"; "Free and informed choice"; "Internal commitment to the choice and constant monitoring of the implementations". Typical action strategies that flow from such governing variables are:

Design situations or encounters where the participants themselves originate the information and have a strong sense of causing the actions.

Let each task be controlled jointly by the relevant participants.

Arrange matters so that protection of self is a joint enterprise and oriented towards development and growth.

Let protection of others be a bilateral or multilateral responsibility.

Like the other constructs of the target environment, effective organizational systems for double-loop and second-order learning systems cannot be accomplished in just one transition stage. Time, patience and expert intervention are all necessary. Argyris & Schön [1977: Parts III and IV] provide extensive descriptions of interventions aimed at building Model O-II learning systems, which can readily be adapted to become part of an IT management strategy. A concise description of the two Models is given by Argyris [1977].

Salaway [1987] reports the results of a study of user/developer interaction in a system development project, where a new "Model 2 interaction methodology" successfully generated more valid information with increased detection of errors.

III. STAGES OF COMPANY DEVELOPMENT

It would be a corollary of any dialectical approach to strategic decision making that the organization will pass through succeeding stages of development, contradiction and conflict, and further development, in its progress towards the target environment. This is made explicit in the present Framework through the concepts of strategic thrusts and transition stages, against the background of incremental implementation and learning loops.

At the same time, researchers and theorists in the fields of both business strategy and IT management have claimed that companies pass through historical stages of development, which are the inevitable consequences rather than planned elements of the strategies they actually carry out. When customizing and instantiating this Framework for use in a specific company, decision makers will have to enquire whether and how the postulated historical stages of development affect the formulation and implementation of their company's IT strategy - in particular, the selection and timing of transition stages and the development of learning systems.

A. Stages in the Business Domain

Historical stages of development, if they are significant for a given company or its industry, will affect the determination of the strategic purposes and uses of IT, and the corresponding competences needed in the four decision making domains. They should, therefore, be taken into account in the dialectical debate of the Context Component and in the strategic option generator of the Content Component. The results of the analysis should be reflected in the Corporate IT Scenario and the IT Positioning Statement.

The following Sections describe three different views of historical development.

1. Phases in the Utilization of Resources

In his study of the history of American industrial enterprises, Chandler [1962] came to the conclusion that:

> "If the need to use resources provided the dynamic force that changed structure and strategy, the nature of the investment in these resources helped to determine the course and direction of growth and of subsequent structural change. The type of investment, in turn, depended on the technology of production and the techniques of marketing of the individual companies' original product line or lines. Finally, the rate of growth and the effectiveness in the use of the enterprise's resources rested on the ingenuity and ability of its administrators ..." [Chandler, 1962: 384]

This Framework is specifically concerned with the use of IT as a dynamic force changing the structure and strategy of a company. It is on the type of IT investment in the value chain, on the particular way in which the relations of production are changed, and on the ingenuity and ability of the available strategic IT decision makers, that the success of a company's IT strategy will depend. Chandler went on to describe four historical phases in the acquisition and use of resources by a growing company:

> "... the initial expansion and accumulation of resources; the rationalization of the use of resources; the expansion into new markets and lines to help assure the continuing full use of resources; and finally the development of a new structure to make possible continuing effective mobilization of resources to meet both changing short-term market demands and long-term market trends. Although each company had a distinct and unique history, nearly all followed along this general pattern." [Chandler, 1962: 385]

Wiseman [1985: 44-47] describes how the use of the strategic option generator will vary in these phases of resource utilization. During the first phase (accumulation of resources), for example, the likely strategic thrusts are growth and alliance, while during the second phase (rationalization of resources) they are likely to be cost leadership and innovation.

It would be part of the meta- and macro-architectural analysis of the human resource dimension (Section 4.4.V.) to determine the kinds of decision making competence that will be required in each of the four decision making domains, in each of the four phases, and hence the kinds of learning system required.

It will probably also be found that the responsibilities of certain domains are more prominent in some phases than in others. For example, it may be found that the responsibilities of owners are most prominent in the first and third phases (initial business needs for IT, and expansion into new purposes and uses); developer responsibilities in the first, third and fourth phases (initial applications and infrastructure, development into new application areas and infrastructure requirements, and (re)development of mature strategic business systems and integrated company-wide IT infrastructure); and user and operator responsibilities in the second and fourth stages (rationalization of resource usage and controls, and the ongoing delivery and mature usage of integrated human and information systems).

If the transition stages of the IT strategy are consciously mapped onto a company's expected future phases of resource acquisition and utilization, it may well be found that the expected shifts in domain responsibilities are significant enough to justify the use of concepts like "driving force" and "driving function". For example, the driving force in a certain stage may be the development of new markets, with marketing and distribution as the driving functions. In another stage it may be volume production, with manufacturing or delivery as driving functions.

Value chain analysis will provide specific keys to the IT infrastructure and systems (Section 4.4.III.), and hence to the learning systems, demanded by different driving forces and functions. More general guidelines to the shifts in emphasis and approach that will be required when driving forces and functions change can be obtained from sources such as Ansoff [1987], Robert [1983] and Tregoe & Zimmermann [1980]. Indeed, part of the learning problem would be to generate understanding and acceptance of the fact that the focal points of the IT strategy can and probably will change as the transition stages unfold.

> "A key feature of strategic orientation - and a difficult one to introduce into a firm - is the dispassionate view of the firm's historical successes: a preparedness to abandon 'sticking to the knitting' in favor of 'being where the action is'." Ansoff [1987]

2. From Competitive to Entrepreneurial Mode

A shift from the competitive mode to the entrepreneurial mode (Section 4.3.II.B.2.), and hence from alignment to impact IT strategy, is not always a clear-cut choice between one strategic posture and another. It has already been suggested (Section 4.6.II.A.) that what is seen as competitive behavior in one part of the organization may seem entrepreneurial in another. Moreover,

> "in practice one finds variation of behaviour within each mode: competitive behaviour varies from no-holds-barred, all-out aggressive competition to bureaucratic unresponsiveness to customers of established monopolies; entrepreneurial behaviour ranges from reluctant imitation of competitors' new products to a continuing stream of innovations." [Ansoff, DeClerck & Hayes, 1976: 48]

Recognizing that a transformation of the strategic posture of a company is "not only a cognitive-logical problem, but also a psychological-social process", Ansoff, DeClerck & Hayes [1976: 68, 72] offer a comprehensive framework for planning the "dynamics of posture transformation" that rests on the same commitment to "directed incrementalism", which they call the "planning-learning process", as the present Framework.

Their diagnostic and prescriptive tables assume four different sets of environmental and planning conditions, Stable, Reaction, Anticipation, and Interaction, which correspond to Ackoff's planning orientations, Inactive, Reactive, Preactive and Interactive (Section 4.1.III.A.). They explicitly map these conditions to industry and product life cycle stages, which allows the issues of posture transformation to be taken into account in the IT Positioning Statement (Section 4.3.IV.A.)

Separate tables are presented for each of the two strategic postures - competitive mode and entrepreneurial mode - and taken together they can be used to identify contradictions, errors and the conditions for error in current development plans. The purpose of the analysis would be to help in specifying learning system requirements according to the two modes, and to the need to transform the organization (or a sub-group) from one mode to the other if this is necessary to make a particular IT strategy feasible.

3. Evolution of the Planning System

A third view of historical development in the business domain is provided by Gluck, Kaufman & Walleck's [1980] description of the evolution of corporate planning systems. The particular emphasis is on companies whose managers are willing to restructure the organization to create successful plans. They identify four phases of evolution, and the value system on which each is based:

Phase	Value System
Basic Financial Planning	Meeting the budget.
Forecast-Based Planning	Predicting the future.
Externally-Orientated Planning	Thinking strategically.
Strategic Management	Creating the future.

The value of this view lies in the insights it provides into the different kinds of planning process that are likely to be encountered and/or required in the different stages of historical development. Raphael [1986], for example, describes the evolution of strategic decision making at Bank of America in terms of this model.

Such a view, together with careful analysis of the organizational linkages between different components of the planning process along lines such as those suggested by Miesing [1984], can help in planning the transformations of internal planning processes that will be required as the IT management strategy unfolds.

In particular, it can provide guidelines for the development over time of the Information Technology Support Organization (ITSO) itself (Sections 4.4.II.B.5. and 4.4.V.C.2.), which from the point of view of this Framework is the single most important element of the corporate planning process. Both the planned transition stages, and changing environmental pressures in different stages of company history, must be expected to induce changes in the strategic role of the ITSO, and this is a major issue for many researchers and theorists (e.g. Advanced Systems Inc. [Course 5060]; Johnston & Carrico [1988]; McFarlan and McKenney [1983]; Metz [1986]; Nolan [1985]; Reynolds [1985]).

Once again, these historical stages of development can be taken into account in the IT Positioning Statement, in this case through the medium of the "IT strategy evaluation grid" (Section 4.3.IV.A.; Figure 12). The idea would be to determine whether or not the Box in which the company is, or wishes to be, is congruent with the evolutionary phase of planning the ITSO has, or will have, reached. Mismatches would indicate the learning and adaptation still required. The following examples are intended to suggest the kind of thinking involved, and make no claim to empirical or theoretical validity. They are set against the background of Gluck, Kaufman & Walleck's [1980: 157] chart of the four evolutionary stages of corporate planning.

> Support Box: This Box may be deemed to correspond to the Basic Financial Planning phase. The planning focus would appropriately fall on cost-cutting, in both the management and the application of IT. The ITSO would help establish criteria for minimum costs, projects on time and within budget, and so forth.
>
> Factory Box: Because the major requirement is good support of current business systems, the ITSO focus remains on

cost-cutting and efficiency, but with additional emphasis on capacity management and the prediction of future business volumes. The corresponding evolutionary phase may be deemed to be Forecast-Based Planning.

Turnaround Box: As the company and its ITSO are required to become increasingly sensitive to market needs and the activities of the competition, the emphasis shifts to Externally-Orientated Planning. The ITSO role evolves from passive "computer support" to active participation in the evaluation of strategic alternatives. New technological roles also emerge, e.g. the provision of end-user computing facilities and technical support for non-technical users of microcomputers

Strategic Box: The orchestration of IT resources to create significant and sustained competitive advantage for the company suggests that the corresponding planning phase is Strategic Management. The ITSO assists in equipping the company with a formal strategic IT planning framework, establishing creative, flexible planning processes, and generating a business vision for IT and a supportive value system and climate.

This view of the evolution of internal planning processes can be used dialectically, to expose contradictions between stated planning aims and actual planning processes, and to help in achieving congruency between company development and decision maker development. For example, the temporal sequence of strategic boxes implied by conventional product/business life cycle analysis (Section 4.3.IV.A.) is not the same as that implied by Gluck, Kaufman and Walleck's evolutionary phases of corporate planning, and the implications of this disparity must be investigated. King's [1983(1)] framework for evaluating a company's strategic planning system provides a practical and comprehensive means of doing this.

B. Stages in the IT Domain

The above three views of historical stages of development reveal a sequence in the analysis of learning system requirements, from the evolution of the overall business strategy, through the evolution of the internal planning environment, to the evolution of the planning processes. Following this theme, the next step would be to enquire into the existence of historical stages of development within the Information Technology Support Organization itself.

1. The Nolan Stages Theory

Nolan, Norton & Company have built a very successful world-wide consultancy and education practice on the proposition that there are indeed overall stages of maturity in the IT management functions of a company. Their model has itself evolved, from an original "hypothesis" of four stages [Gibson & Nolan, 1974; Nolan, 1973] to the six-stage learning curve and "recharting framework" underlying the modern practice [Advanced Systems, Inc., Courses 5051 and 5053].

	Version of the Stages Theory			
Stage	1974	1975	1979	1983
1	Initiation	Initiation	Initiation	Initiation
2	Expansion	Contagion	Contagion	Contagion
3	Formalization	Control	Control	Control
4	Maturity	Integration	Integration	Integration
5	-	-	Data Admin.	Architecture
6	-	-	Maturity	Demassing

The meaning of the various stages is well-documented in readily accessible sources [e.g. Advanced Systems, Inc., Course 5051; Gibson & Nolan, 1974; Nolan, 1973; Nolan, 1982]. The 1983 version of the model consists of two S-shaped learning curves corresponding to the first three and the latter three stages, separated by a "technological discontinuity". These are intended to represent two eras in the evolution of a company, "The Data Processing Era" and "The Era of the Advanced Stages".

> "The nature of the discontinuity between the two eras has been the subject of ongoing research. Recent evidence indicates that failure to complete Stage III of growth results in a much more pronounced discontinuity between the two curves. If Stage III maturity is not reached, the second growth curve will begin lower than the first one. In this case, there is a short period of decline before growth can continue into Stage IV." [Advanced Systems Inc., Course 5051: 7]

The six stages arise out of four underlying "growth processes" [Advanced Systems Inc., Course 5051: 8-9; Nolan, 1979: Exhibit 1], which can be mapped to the present Framework as follows:

> Applications Portfolio: This corresponds to the human and information systems dimensions of the Target Environment Architecture. The portfolio progresses from the automation of simple tasks - typically functional cost reduction - in Stage 1 to integrated applications that "mirror" the information flows of the organization in the advanced stages.

> The Users: This corresponds to the human resources dimension of the architecture. User participation evolves from the "hands off" climate of Stage 1 to the acceptance of joint business and IT responsibility for IT strategy in the advanced stages.

> The Resources: This corresponds to the IT infrastructure dimension of the architecture. Planning and control of IT resources evolves from "lax" in the first two stages, through a period of management reaction with tight controls, to strategic IT and data resource planning in the

advanced stages.

The Management: IT management evolves from a highly specialized approach geared to technological learning in Stage 1, to the company-wide participative IT decision making envisaged in this Framework, in the advanced stages.

The Nolan stages theory has two broad areas of application in the present Framework:

Evaluation: It can be used to evaluate the readiness of a company and its strategic IT decision makers for a contemplated IT strategy, or for one of the transition stages. The evaluation would be carried out in terms of "benchmarks" formulated according to the underlying growth processes [Nolan, 1979: Exhibit V; Nolan, 1982: Ch. 10].

Criteria such as those used by Benbasat, Dexter, Drury & Goldstein [1984: Table 1] and Drury [1983: Tables 2 & 3] in their empirical critiques of the Nolan stage theory can equally well be used by strategic IT decision makers to instantiate the benchmarks for their own companies.

King's [1988] framework for evaluating a company's information systems planning effort provides a practical and comprehensive means of putting an evaluation into practice.

Prescription: As a prescriptive tool, the stages theory assists in determining the gap between the capability required for a given transition stage and the capability the company currently possesses, and hence where the current focus of the organizational IT learning systems should be placed. In particular, it would be used to determine the work that has yet to be done to complete Stage 3 maturity, and to "re-chart" for the advanced stages [Advanced Systems Inc., Courses 5051 and 5053].

Other ITSO growth models have been proposed, which are more specific than the Nolan stages theory. These are useful in their own right, in respect of the specialized areas they address. Taken together, they can be used dialectically to investigate mismatches and contradictions among the different internal growth processes they describe. Examples of these other growth models are described in the following Sections.

2. The Maturity of Capacity Planning

Artis [1985] contends that, typically, the capacity planning process of a company evolves through five stages:

Stage 1 - Vendor Capacity Planning: The successful supplier, after carrying out the company's first step in capacity planning, i.e. sizing its first computer system, usually goes on to provide further system sizing as part of its ongoing marketing effort.

Stage 2 - Special Studies: Individuals in the data processing department are periodically assigned to conduct capacity studies for special purposes.

Stage 3 - Technician: This stage is dominated by capacity planning technicians and their tools, and is usually the most expensive stage. Because the technicians often do not communicate very well with end users, they tend to have few political ties and poor understanding of the organization.

> "At its height, the third stage is characterized by serious contradictions. On the one hand, corporate managers worry that they aren't receiving appropriate information, despite significant expenditures for staff and tools. On the other hand, the capacity planners are confused as to why corporate decision makers are ignoring the sound technical arguments they have provided." [Artis, 1985: 55].

Stage 4 - Organizational Development: Capacity planners transfer their focus from tools to end-user requirements, reporting and communications. Their efforts are now synchronized with the budget cycle so that their recommendations can be integrated with the company's financial plans.

> "The fourth stage ends when the corporate decision makers come to view the capacity planning as a reliable and essential input to their decision making process. Today, only a small fraction of installations can be said to be in the fourth stage." [Artis, 1985: 56]

Stage 5 - Mature: Senior corporate management have confidence in the capacity planners and perceive their results as essential to their decision making process.

3. The Maturity of Applications Development

Albrecht [1983(1)] has developed an "AD/M Maturity Grid" for measuring the maturity of the applications maintenance and development functions in a company. This tool would be useful at the macro- and micro-architectural levels, when design and development intentions become specific. It is based on Crosby's [1979: 38-39] "Quality Management Grid", and produces a profile of four categories: management; resources; processes, standards and guidelines; tools and techniques. Each category is evaluated on an ordinal scale of 1 to 5, with checkpoints characterized by the Crosby stages of quality management maturity: "Uncertainty", "Awakening", "Enlightenment", "Wisdom" and "Maturity".

> "If you would like to use the Grid to compare different operations, keep in mind that the purpose of comparisons is to get those moving who aren't moving. It is not simply to report the results." [Crosby, 1979: 37]

4. Stages of Growth in Office Information Systems

Building on the Nolan stages theory and work by Zisman [1978], Hirschheim [1983] proposes a 5-stage theory of growth to help organizations develop strategies for electronic office information systems. Hirschheim's model includes the same three early stages as the Nolan model, but only two advanced stages, i.e. integration and maturity. There is no discussion of a discontinuity between the early stages and the advanced stages.

The model can be modified to take into account the strategic posture of a company since, according to Hirschheim, the shape of the 5-stage learning curve will depend on management's decision making approach: Procrastination, Learning or Innovation. These postures can in turn be related to the classes of environmental and planning conditions postulated by Ansoff, DeClerck & Hayes: Stable/Reaction, Anticipation and Interaction as underlying the competitive and entrepreneurial modes of strategic behaviour (Section 4.6.III.A.2.).

IV. LEARNING AND INNOVATION

A. Learning Systems

Two broad classes of learning system can be identified:

> Explicit Learning Systems: These provide the requisite education and training, according to formal capability development plans. Ansoff, DeClerck & Hayes [1976: 55-65] provide a conceptual framework that can be adapted to the purpose of diagnosing the "capability transformation" a company will require to carry out its IT strategy, and of phasing formal capability development plans into the transition stages. Bearing in mind that, in the present Framework, a fundamental objective of the learning systems must be to develop an interactive planning orientation within the company (Section 4.1.III.A.), a list of "desired

managerial capabilities" can be determined, according to:

Strategic posture - competitive, or entrepreneurial, or transition from competitive to entrepreneurial.

Planning orientation - reactive, inactive, preactive or already interactive, and the transition from the current orientation to interactive.

Timing of the learning - technical precedences arising out of the nature of the education and training to be provided, as well as strategic priorities arising out of the requirements of the Master Transition Plan.

<u>Implicit</u> <u>Learning</u> <u>Systems</u>: These are the organizational relationships, control systems, corporate cultural values and campaigns, and other features of general organizational life that provide situational and experiential learning - for example, through participation in decision making processes.

> "A major emphasis in the transformation plan must be on the interrelation of the strategy and capability processes. Certain elements of the transformation can be the natural outcome of strategy-changing activities (personal skill, team work, information). Thus an approach of changing capabilities by doing strategic work is attractive, particularly since it combines and interrelates the cognitive process of planning with the socio-dynamics of 'implementation'." [Ansoff, DeClerck & Hayes, 1976: 64]

Good organizational dialectic is the main vehicle of implicit learning systems. It contributes to the management of disjunctive stress - for example, as between users or operators and the business systems within which they are expected to work (reduction of alienation), and as among the decision making domains, the levels of participation, the workgroups, and the business units (reduction of conflict) - and of performance stress - through clear definition of ends and expectations, and through analysis and resolution of contradictions.

The principal factors in the design of learning systems that emerge from the review of perspectives and stages of learning (Sections 4.6.II. and III.) may be summarized as a set of "design parameters" as follows:

<u>Organizational Disciplines</u>: dialectic, strategy, design, development, and learning.

<u>Organizational Levels</u>: individual, work-group, business unit and company.

<u>Aspects of Adaptation</u>: ends, attention rules, search rules.

<u>Stimuli for Adaptive Learning</u>: performance stress and disjunctive stress.

<u>Historical Stages of Company Development</u>: the maturity of resource utilization, the intensity of interaction with the environment, the evolution of company planning.

<u>Stages of Maturity in IT Decision Making</u>: Nolan and others.

<u>The Formal Knowledge Base,</u>: five sets of shared images and maps - the Corporate IT Scenario, the IT Positioning Statement, the Target Environment Architecture, the Master Transition Plan, the Learning Systems.

<u>Requirements for Collective Competence</u>: relevant and transferable experience; evaluation of the cumulative gain in competence; controlling the attrition of competences.

Levels of Incremental Strategy Implementation: meta-architectural, macro-architectural, micro-architectural.

Levels of Learning: second-order, double-loop and single-loop.

Classes of Organizational Learning System: Model O-I and Model O-II, each with characteristic governing variables and action strategies.

Two fundamental objectives that should be kept in mind when designing organizational IT learning systems are:

To ensure that individual learning does in fact take place. This will involve the development of initiative and innovativeness in general, for example, through lateral thinking skills [De Bono, 1970], as well in particular innovation skills, for example "system builders", "loss cutters", "socially conscious pioneers", "sensitive readers of early warning signals" [Kanter, 1983: 210].

To ensure that individual learning does in fact become organizational. This will require that individuals, acting as the learning agents of the organization, recognize and respond to learning situations, and record the relevant and transferable parts of what they have learned in the shared images and maps.

From this point of view, the problem of ensuring individual and organizational IT learning can be seen as part of the two more general problems: that of managing innovation and innovators within the context of a given, ongoing organization; and that of assimilating innovations into the fabric of that organization (Figure 4). These are discussed in the following Sections.

B. Innovation

Kanter's [1983: Part Four] process and architecture for "corporate innovation", i.e. intra-organizational innovation, exemplifies the approach needed in the present Framework:

> "These 'new entrepreneurs' do not start businesses; they improve them. They push the creation of new products, lead the development of new production technology, or experiment with new, more humanly responsive work practices." [Kanter, 1983: 210]

Focusing on the political and cultural aspects of change management, Kanter describes three major sets of skill requirements: the power skills needed to form coalitions and to get ideas accepted and resources committed; the skills needed to resolve the dilemmas of participative decision making; and the skills needed to re-architect the culture of the organization.

Power Skills: Since innovative accomplishments change existing organizational structures and jobs to bring new capability to the organization, they entail disruption of existing activities and redirection of human energies.

> "And change, no matter how desired or desirable, requires that new agreements be negotiated and tools for action be found beyond what it takes to do the routine job, to maintain already established strategies and processes. ... However differently they start, corporate entrepreneurs soon find that they have something in common: the need to exercise skills in obtaining and using power in order to accomplish innovation." [Kanter, 1983: 212-213]

Particular power skills include:

Gathering the information and agreeing the problem definition, to arrive at "saleable" innovations.

> Coalition building - gaining senior management approval "in principle"; pre-selling; creating "cheerleaders"; horse trading; and, once resources and support are in hand, formalizing the arrangements for continuing participation of the key supporters.
>
> Mobilization of the action phase - team building; handling opposition and blocking interference; maintaining momentum; rule changing, bending and breaking as needed; "managing the press"; and delivering on promises.

Corporate entrepreneurs cannot be "solo artists". They produce their innovative achievements through working in collaborative/participative fashion with other highly talented artists - persuading much more than ordering, team building, seeking input from others, showing sensitivity to the interests of others, and, last but not least, sharing the rewards and recognition [Kanter, 1983: 237].

<u>Dilemmas of Participation</u>:

> "The integrative, participative vehicles surrounding innovators - open communication, interdependent responsibilities, frequent team efforts - keep them close to the power sources they need to operate, ensuring access to information, resources, and the support needed for implementation." [Kanter, 1983: 241]

Participation can be overdone, and the innovative spirit can be smothered in steering committees, task forces, quality circles, and an endless variety of other meetings. Even when it is not overdone, participation creates problems of its own which have to be managed along with the problems of innovation itself. Kanter describes in detail six broad classes of dilemma in managing participation: dilemmas of beginning; dilemmas of structure and management; dilemmas of choice of issue; dilemmas of teamwork; dilemmas of linking teams to their environment; and dilemmas of evaluation.

Architecture of Culture and Strategy Change: Precisely the same problem that arises in IT strategy research (Section 3.II.A.) and in the analysis of the strategic planning environment (Section 4.2.III.A.) arises as a fundamental issue in the management of intra-organizational innovation - that of unravelling and re-synthesizing "fact, fiction and the fact of fiction".

> "All the pieces can be right - new product prototypes already test-marketed, new work methods measured and found effective, new systems and structures piloted in local areas - and still an organization can fail to incorporate them into new responses to changing demands. ... The ultimate skill for change mastery works on [the] larger context surrounding the innovation process. It consists of the ability to conceive, construct and convert into behavior a new view of organizational reality."
> [Kanter, 1983: 278-279]

In other words, the over-arching skill is the ability to identify and synthesize decision makers' assumptions, and to develop from them an effective, shared vision of the business, as described in the Context and Content Components. Kanter [1983: 281] goes so far as to say that organizational change is stimulated not so much by the pressures of the environment resulting per se in a buildup of problems that triggers an automatic response, as by the perceptions of environmental pressures held by key decision makers. Furthermore, a company with a diverse group in the "dominant coalition" of decision makers is likely to pick up on more external cues than a company with a smaller, more homogeneous set of top decision makers, or with a single sub-group having disproportionate power to dictate the focuses of attention.

> "Innovation and change [therefore] are bound up with the meanings attached to events and the action possibilities that flow from those meanings. But that very recognition - of the symbolic, conceptual, cultural side of change - makes it more difficult to see change as a mechanical process and extract the "formula" for producing it." [Kanter, 1983: 281]

The architecture of culture and strategy change requires an awareness of foundations and beginnings [Kanter, 1983: 283] - the prehistory of events, both positive and negative, in which "changes really start". It also requires an acceptance of the fact that part of the innovation process is the "rewriting of corporate history": individual initiatives will disappear into collective achievements; early events and people will disappear into the background as later events and people come forward; conflicts will disappear into consensuses - the organizational memory cannot afford grudges; equally plausible alternatives will disappear into obvious choices; accidents, uncertainties and muddle-headed confusions will disappear into clear-sighted strategies; multiple events will coalesce into single thematic events; and the fragility of changes, which start as contradictions with the residues of older organizational forms, disappears into solidarity and full realization.

> "Organizational change consists in part of a series of emerging constructions of reality, including revision of the past, to correspond to the requisites of new players and new demands." [Kanter, 1983: 287]

> Kanter [1983: 287-303] goes on to describe in detail five highly inter-dependent building blocks present in all productive corporate changes: departures from tradition; crises or galvanizing events; strategic decisions and the integrative systems they depend on; individual "prime movers"; and action vehicles. Binding all of these, are the "visions and blueprints of change masters".

In addition to Kanter's three sets of skill requirements, insight is needed into the dynamics through which individual learning and innovativeness can become institutionalized as organizational learning and corporate innovation. One approach to gaining this insight is through Lessem's [1984] "spectral theory", which can be adapted as shown in Figure 25. Seven levels of individual learning are identified in the first column of the Figure. Working from bottom to top, these can be described in terms of increasing levels of IT decision maker development as follows:

> <u>Action</u>: The ability to develop, use or operate parts of the IT infrastructure and strategic business systems, with little or no need for insight into the overall rationale of the target environment.

> <u>Skill</u>: A higher level of ability in developing, using or operating infrastructure and business systems, requiring certain personal knowledge, skills and attitudes, and insight into the rationale of some part or aspect of the target environment.

> <u>Knowledge</u>: The ability to analyze the strategic uses of IT and to develop, use or operate infrastructure and business systems accordingly.

> <u>Will</u>: The ability to analyze the strategic purposes of IT and to commission, develop, use or operate infrastructure and business systems to meet those purposes.

Concept: The ability to conceptualize the generic strategies, structures and processes of an organization, and to (re)direct the appropriate purposes and uses of IT.

Meaning: The ability to understand political, social and economic context and role of the enterprise, and how these can be translated into a successful, growing company.

Creativity: The ability to articulate a business vision and mission for the enterprise, to communicate it to others, and to ensure that it is translated into effective strategies, structures, processes, IT infrastructure and strategic business systems.

According to Lessem [1984: 21], the organizational process of innovation can be considered as "learning in reverse" - it starts with the creative idea and ends with a physical product. Thus a level of innovation can be identified corresponding to each level of learning, as shown in the second column of Figure 25. Reading from top to bottom:

Creative Person: One who originates an idea as a unique solution to a significant business problem.

Gatekeeper: One who identifies the underlying market need and concept that the idea will serve.

Executive Champion: The decision maker who causes the idea to be developed into a product or service, and ensures the organizational (re)design needed to bring it to market.

Product Champion: One who ensures sustained commitment of the required organizational resources.

Project Controller: The task of setting out the detailed steps for effective implementation of the product, service or organizational (re)design.

Project Manager: Managing the people and other resources involved in the implementation project, and ensuring ongoing communication among all participants.

Producer: One who is involved in making delivering the final product or service through the (re)designed organization.

It should be noticed that the levels of learning refer to individual competence, while the levels of innovation refer to organizational activity. To give effect to the linkage between the two, learning systems should be based on three sets of considerations::

Vertical Dependencies: It can be argued that, as far as the competence of an individual is concerned, each level of learning is fairly independent of the other levels. For example, a creative systems architect may or may not be a competent computer programmer. Collectively, however, the usefulness and success of any competences a company may possess at a given level are wholly dependent on complementary competences at all the other levels. The implication of this for the present Framework, is that the learning systems have to be planned holistically, and the principles of integration, differentiation, co-ordination and contingency (Section 4.1.III.D.) will apply.

As far as the organizational processes of innovation are concerned, it is clear from Kanter's account that, at least politically and culturally, every level of innovation is intimately dependent on all the other levels. It is not, in fact, meaningful to speak of successful innovation except in terms of all seven levels.

Horizontal Relationships: The third column of Figure 25 summarizes Lessem's [1984: 22 - 34] "key questions" linking innovation and learning at each level:

<u>Mission and Vision</u>: What is my personal mission? Where does my imagination lead me? How is my idea going to change the fortunes of the company? What, precisely, is this idea, and what makes it a unique solution to a significant organizational problem.

<u>Needs</u>: Which ideas have potential? What is their importance to me? What underlying company purposes are they likely to serve? How is IT developing and where does this particular idea fit in? With which suppliers, customers or collaborators should we ally ourselves?

<u>Structure</u>: How does this idea affect my present roles, tasks and responsibilities? What product and organizational (re)design is needed to bring this idea to market? How will the development be structured, from start to finish? How will different functional areas in the company interact in this development? How will project teams be integrated into the functional organization?

<u>Goal and Influence</u>: Why should I personally commit, and why should my organizational sub-group? How can it be ensured that the organization will commit the necessary resources, and that other organizational subgroups will cooperate? What is the risk, for me, for my sub-group, and for the company, and what is the likely return?

<u>Progress and Monitoring</u>: How do we formally evaluate ideas? How can the detailed steps be taken, in the right order and at the right pace, to ensure effective implementation? How are projects and departments monitored and controlled financially? What time scale do we work to?

<u>Participation and Communication</u>: What are my particular skills and motivations and how do they relate to this idea? How will we involve different people and their skills, from different parts of the organization, and how will we ensure effective communication?

<u>Requirements and Production</u>: How do we physically produce the new product or service, in conformance with the requirements, on time, and within budget?

<u>Particular Innovation Skills</u>: As the learning requirements and innovation activities are identified at each level, the particular focus and scope of each decision making domain and level of participation (Sections 4.4.V.B.1. and 2.) can be made specific. In the remaining columns of Figure 25, roles, tasks, responsibilities and requisite personal characteristics can be set out, using a staffing framework such as that proposed by Roberts & Fusfeld [1981]. Maidique [1980] shows how the staffing requirements will vary according to the company's stage of development.

C. <u>Assimilation</u>

From an innovation point of view, organizational IT learning is essentially a long-term problem, since the conditions for learning and an innovative spirit must be expected to develop over many transition stages. The cognate problem, ensuring that the action plans for appropriate innovations do not stagnate and that the new technologies are assimilated into the organization without disruption, is essentially short-term.

A certain time-lag is required before an innovation reaches wide acceptance in a company, e.g. from the external origination of a new technology, through its recognition and introduction into the company on a trial basis, until its eventual diffusion to the intended areas within the organization. The cost of this process is an unrealized investment until the very end of the time-lag, when the intended benefits begin (or fail) to flow.

Thus learning systems for assimilation would be concerned with managing the costs and progress of the innovation time-lag.

> "One of the most difficult issues in managing the Computer Architecture Product Spectrum is balancing slack and control. By slack, I mean creating an environment that encourages experimentation with the product to discover how the the product may be used in a particular organizational setting. The high slack environment generally leads to a product being used <u>effectively</u> in support of a business function, but in a highly inefficient manner. Once it is discovered <u>how</u> the product can be used effectively, control can be introduced to promote <u>efficient</u> use. The slack environment should precede the control environment. But the main issue is one of timing to appropriately balance slack and control so that a particular product is used in the most effective and efficient manner over time."
> [Advanced Systems Inc., Course 3947: 18]

Learning systems for assimilation are needed, for significant system changes in general and new technologies in particular, in order to expedite the following decision making stages:

> Determining which are undesired changes and technologies and excluding them from further consideration, which includes preventing their surreptitious introduction.
>
> Introducing the desired technologies or modelling the proposed changes, on a trial basis, at the right points in time.
>
> Reaching the decision point (accept/reject) as quickly as possible.

Determining and employing methods to hasten the desired diffusions.

Doing all of the above without stifling the spirit of innovation, which entails balancing slack and control, as appropriate to successive stages of assimilation.

Figure 26 shows the framework for managing technology assimilation into an organization, developed by McKenney & McFarlan [1982; McFarlan, McKenney & Pyburn, 1983]. Their discussion is in terms of a new technology, but the framework applies to any significant system change.

The underlying assumption is that different management approaches are needed at different stages in the assimilation process. Thus Phases 1 and 2 would be the responsibility of an entrepreneurial systems group, which may be permanent, or drawn ad-hoc from a number of departments:

Phase 1: This phase begins with the decision to try out a technology that is new to the organization. It may consist of several complementary projects and user training, revolving around: learning about the technology and how to apply it, organizing the test site, determining the staff skills needed, and setting up the first applications.

Stagnation Block A could occur for a variety of reasons, e.g. supplier failure, poor user participation, incompetent project management, unanticipated technical problems, or lack of senior management attention. All projects studied by McFarlan & McKenney that were stalled in Stagnation Block A had significant cost overruns.

Phase 2: This phase involves trying out the technology in tasks beyond those mentioned in the initial proposal. Planning focuses on user consciousness of the new technology and potential applications. User pilot projects are a major key to success.

Stagnation Block B could occur if there is too much focus on implementation at the expense of experimentation and dissemination of learning.

The decision to reject the technology could be made at any stage, but normally one would expect this to come at the end of Phase 2. McKenney & McFarlan [1982: 115] recommend that, where possible, Phase 1 and 2 technologies should be kept organizationally separate from Phase 2 and 3 technologies, so that the efficiency goals of the latter do not blunt the effectiveness goals of the former. Thus Phases 3 commences with the transfer of responsibility from the entrepreneurial system group to the control-orientated group.

<u>Phase</u> <u>3</u>: Management controls and cost/benefit models are drawn up, and there is frequently a need for adaptation of organizational structures and functions. The planning objective is to decide on permanent application areas and to implement them cost-effectively. The Phase tends to be dominated by short-term, organizational considerations, sorting out troublesome applications, upgrading staff knowledge levels and using the technology efficiently.

The Phase will end in Stagnation Block C if there is too much standardization and control - these inhibit legitimate dissemination and encourage surreptitious, unproductive experimentation.

<u>Phase</u> <u>4</u>: The final Phase commences with the decision to transfer the technology to all the intended organizational areas. Organizational learning and management control are completed, and the planning focus returns to an intensive look at future business and technology trends.

Cash & McCleod [1985] offer further insights into managing the introduction of information technologies in companies that are strategically dependent on them. The dilemma such companies face is that, on the one hand, it is crucial that they rapidly identify and exploit appropriate IT opportunities while, on the other hand, the rate of new announcements is much faster than most organizations can assimilate. They propose a simplified two-phase assimilation framework - the first phase (innovation) corresponds to Phases 1 and 2 of the McKenney & McFarlan framework, and the second phase (control) to Phases 3 and 4.

In discussing the need for and responsibilities of an "Emerging Technology Group", which will vary according to the two phases, Cash & McCleod effectively provide a charter for the role of the Information Technology Support Organization (ITSO) in fostering innovation and guiding assimilation. Leonard-Barton & Kraus [1985] provide further insights into the dual role of technology change management - to serve as both technical developers and implementors - and show how this dual role can be fulfilled in a marketing-orientated manner.

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4.7 CONCLUSION

IT strategy has been characterized in this Framework as the formulation of a Target Environment Architecture and its incremental implementation in a company-wide organizational development programme. This is consistent with the general view of development and competence that underlies the Framework. Following Ackoff [1981: 34-38], development is seen as a process in which the company as a whole and the individuals within it increase their ability and desire to satisfy their own needs and those of others. Development is seen to be more a matter of increasing competence, capacity and potential, than of particular outcomes. Against this background, strategic IT decision making is more a matter of motivation, responsibility, knowledge and understanding, than of particular attainments. It has less to do with how much resource the company needs to carry out IT strategy than with what it can do with the resource it has.

The Framework also has less to do with technology per se than might have been expected. There is more than a little truth in the EwIM project's claim that

> "Information Systems Technology is solved; any currently available technology will work well. Decisions about Information Systems Technology will turn on non-technology matters." [Benson & Parker, 1985: 84]

Similarly, Strassman [1985: xv] finds that the "supply side" examination and assessment of information technology itself will not be of much practical value in decisions about which technologies a company should invest in. "Understanding must begin with meticulous observation of people and organizations under conditions when information technology is or is not applied."

Thus the technology itself is usually not the limiting factor in the application of IT to business strategy - indeed, in many cases it is ahead of the company's ability to grasp its implications and to apply it. The inhibitors are rather the political, sociological, economic and managerial factors in strategic IT decision making, and it is with these that the Framework is primarily concerned

The main reasons why a company needs to make its business vision for the use of IT explicit in a Target Environment Architecture can be summarized as follows:

<u>Consensus</u>: To achieve agreement and ongoing co-operation among all parties involved in strategic IT decision making, by giving them a common language in which to discuss the crucial issues, such as positioning, purposes, uses, costs and benefits, innovation and control, without being forced into premature commitment to specific policies and projects.

<u>Blueprints</u>: To serve as a set of blueprints giving company-wide direction and consistency to all corporate, business unit, work group and individual plans for the development of IT capability - the selection and assimilation of appropriate technologies, the creation of strategic business systems, and the development of IT decision makers (Section 4.6.IV.).

<u>Integrity</u>: To permit the target environment to be implemented incrementally over time, in strategic thrusts and action plans, by providing the means though which congruency between the purposes of IT as originally envisaged and its eventual uses as implemented can be maintained.

<u>Evaluation</u>: To provide a conceptual foundation for analyzing the full strategic and organizational impact of proposed IT applications, and a means of evaluating the aggregate costs, benefits and risks of the overall investment in IT strategy.

Learning: To help practitioners avoid certain dangerous but all-too-common errors of judgment:

Errors of Context: Inadequately providing for the impact of social, political and economic environmental forces on competitive strategy and organizational design.

Errors of Content: Producing an information systems department technical strategy instead of an IT strategy that is recognizably a part of or complement to the company's business strategy.

Errors of Structure: Producing an IT strategy that does not cover all the dimensions of the target environment - typically, an application systems plan with inadequate attention given to the design of organizational tasks and processes, or which is not related to any plan for a feasible technology infrastructure, or which does not take the realities of the environment into account.

Errors of Process: Formulating a technology strategy which the company does not have the resources to implement - typically, believing that a non-trivial IT strategy can be built in 3 to 6 months.

Errors of Learning: Relying on external consultants as the primary intellectual resource, or hoping that strategic thought will somehow come from business and IT decision makers who are manifestly incapable of it - typically, attempting to develop a business vision for IT and commitment to it, without careful selection and briefing of key decision makers and the explicit sharing of assumptions and data in a Target Environment Architecture.

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CHAPTER 5

THE FRAMEWORK IN SOUTH AFRICAN PRACTICE

I. INTRODUCTION

This Chapter is aimed at the fourth objective of the Study:

D. To propose a way of implementing the Framework in South African practice, which will address the key issues and lead to an improvement in the quality of strategic IT decision making.

As stated in the Overview of the Framework, the Components and Parts and the constructs defined in them are interdependent elements of one "systemic process, each feeding and fed by the others" (Section 4.1.II.A.). This accounts for much of the separation and repetition of material in Chapter 4 and, more importantly, it implies that the Framework cannot be implemented strictly in the order of its documentation in that Chapter. It must also be expected that for a given company there will be many optional sequences of implementation to choose from.

In Section II., therefore, the principal constructs of the Framework are reviewed, and the initial activities required to set strategic IT decision making in motion in terms of them are identified. Only the broad sequence of activities is discussed, at the conceptual level. Initial activities required to customize and instantiate relevant parts of the Framework are indicated but not discussed in detail in this Study.

Section III. is concerned with how the Framework can be evaluated for acceptance by specific South African companies. The issues are considered in the light of the findings of the field survey described in Chapter 3, using an adaptation of King's [1983; 1988] model for evaluating existing planning systems. This model has already been proposed for development stage assessment (Sections 4.6.III.A.3. and 4.6.III.B.1.),

In Section IV., it is concluded that the Framework can indeed be implemented in a South African company in a way that addresses the key issues and improves the quality of strategic IT decision making.

II. IMPLEMENTING THE DECISION MAKING CONSTRUCTS

Implementing the Framework will itself be part of the IT management strategy it produces, and thus action plans for its realization must be included in the strategic thrusts of the Master Transition Plan (right-most column of Figure 22). A basic rule-of-thumb is to ensure that relevant portions of each of the Framework's constructs are implemented either ahead of or at least as part of the decision packets that will require them.

The major constructs arising out of the five Components of the Framework, the initial activities they will entail, and how they would fit into an overall planning framework are reviewed in the following Sections.

A. Initial Activities

At the outset it is only necessary to review initial activities, since ongoing activities will be generated by the DMF itself as implementation unfolds in the strategic thrusts (Section 4.5.).

1. The Context Component

<u>The First Fundamental Agreement</u>: It must be agreed by

corporate and business unit management that the company needs a formal IT strategy, and that a formal strategic IT decision making process is also needed.

The scope of the strategy - group of companies, single company, or a business unit - must be agreed.

The shortcomings of the available methodologies, tools and techniques should be understood. It must be agreed that participative IT decision making (e.g. in terms of the Vroom-Yetton Model) and incremental implementation of a target environment architecture (as an approach to IT strategy) are acceptable to the management of the company.

The Participants: The participants in the various facets of formulating company-wide strategic IT decision making must be identified. A domain grid (e.g. Figures 5 and 19) can be used to ensure good organizational coverage.

Dialectical Debate: Those of the participants who will take part in the debate must be selected and briefed. A qualified facilitator must be retained, and the debate carried out.

Environmental Data Scan: Staff must be selected from both corporate planning and the IT domain and briefed. Generic environmental categories must be agreed and instantiated. The means-ways-ends paradigm and the detailed analytical processes, e.g. force field analysis, must be agreed and implemented.

Corporate IT Scenario(s): Format and content must be decided, with a view to facilitating the analyses of competitive strategy and organizational design. The scenario(s) must be prepared, authorized and distributed to the other participants in strategic IT decision making.

2. The Content Component

The constructs and initial activities of the Content Component arise out of the Strategic Option Generator.

<u>The Participants</u>: Analytical responsibilities flowing from the content of the Corporate IT Scenario(s) must be defined and organized. Different participants will be required corresponding to different rows of the Generator.

<u>Analysis of the Competitive Strategy</u>: The target(s) and generic competitive strategy or strategies must be decided.

Focus and detail will differ by industry, company and relevance of S.A. factors, as will the depth of the analysis in terms of value chains and production economics. Analytical approaches range from the informal and intuitive to such formal approaches as King's [1978] "strategy set transformation".

A limited analysis can stop here (Figure 10; Rows 1 to 3 of Figure 11), and implementation can proceed intuitively, using conventional requirements analysis techniques, e.g. those of BSP or Tetrarch.

<u>Analysis of the Organizational Design</u>: The organizational level(s) and application class(es) of use that will satisfy the competitive strategy must be described and candidate strategic business systems identified in broad terms.

<u>The Strategy Evaluation Grid</u>: Which Box the company is currently positioned in and which it wishes to be in must be determined, and the implications of a move made clear. Business life cycles and their implications for transition stage planning should be taken into account.

The Investment Focus: The acceptable overall levels of funding and where they will be directed must be indicated. The technical, political and cultural implications should be taken into account, and mechanistic and simplistic development prioritization processes avoided.

The Competitive Advantage Model: The concepts and measures of competitive advantage to guide all the quantifiable elements of the IT strategy must be worked out and agreed.

The IT Positioning Statement: This statement must be drawn up and marketed to all concerned in the company, subject to confidentiality requirements.

3. The Structure Component

All the constructs and initial activities of the Structure Component arise out of the Target Environment Architecture. In the following, the term "first release" refers to the work that must be done in the first strategic thrust, in order to permit the drawing up of an initial Master Transition Plan. While the first release of the meta-architecture must certainly be consistent, correct and reliable, it cannot be expected to go into very much detail and its life expectancy is short.

The Participants: Flowing from the analysis of the organizational design and the IT Positioning Statement, systems analysis and design tasks must be defined and organized in respect of each of the four dimensions.

The IT Infrastructure Architecture: The first release of the blueprints, interface standards, policies and other logical constructs pertaining to the five virtual constructs must be developed and agreed: workstation; network; applications portfolio; data model; IT support organization. No other work on target environment development can proceed without these guidelines.

<u>The Human Systems Architecture</u>: The first release of the overall strategic business systems analysis, in terms of the value chain(s) and value system and/or the customer resource life cycle, must be completed and agreed. It must be clearly linked to the competitive advantage model developed in the IT positioning analysis.

All four dimensions of the human systems architecture - management functions, planning levels, functional decomposition, and generic value activities, should be covered in broad terms. Intentions with regard to inter-organizational systems should be clearly stated.

<u>The Information Systems Architecture</u>: The first broad outline of the strategic applications portfolio must be completed and agreed, to accompany the human systems architecture. Both the business and the IT perspectives of the portfolio should be covered, and dependencies on the virtual applications portfolio stated.

<u>The Human Resources Architecture</u>: The aims of such an architecture, based on tests for good organizational dialectic, must be agreed. The first release of the Responsibilities Chart, setting out preliminary roles, levels of participation, tasks and decision making success criteria, must be completed and agreed.

The corporate steering committee, business unit steering committees, joint technical review committee, and requisite parts of the IT support organization need to be established early. User committees and most of the IT planning staff can follow at a later stage.

<u>The Target Environment Architecture</u>: All of the above must be put together as the first release of the external meta-architecture, and marketed (in different ways) to all decision making domains, subject to confidentiality.

4. The Process Component

The constructs and initial activities of the Process Component are those required to set all the other activities in motion.

The Second Fundamental Agreement: It must be agreed by the management of the company that the IT strategy should be implemented in a company-wide organizational development programme. They must agree to acquire and implement the needed OD techniques and interventions.

The Participants: The participants in the various facets of implementing the IT strategy must be nominated and briefed.

The Master Transition Plan: A broad outline of the strategic thrusts, technical strategies, timeframes and transition stages must be put together, on the basis of the first release of the Target Environment Architecture.

The first medium-term tactical plan, including the first process and commitment plans, must flow from this activity. The first strategic thrust should cover the customization of the Framework, the first dialectical debate and environmental data scan, and the first releases of the IT Positioning Statement and Target Environment Architecture.

Stakeholders in the first transition stage should be identified as soon as possible, and briefed. It will probably take more time for the transition scenarios, project and resource schedules, and stage-related education and marketing to be described.

The first action plans should cover only the initial activities being described in this Section.

Contingency Plans: Work must commence on the contingency plans, which are likely to extend over several transition stages. Supplier policies, security plans, and disaster recovery planning cannot be delayed, and will therefore require resource allocation in parallel with the mainstream activities.

Control Systems: Similarly, work must commence on devising and installing strategic, architectural and operational controls. Aggregate cost categories must be defined and evaluation techniques and management accounting processes agreed.

5. The Organizational IT Learning Component

The constructs and activities of the Organizational IT Learning Component accompany all the other activities.

Introductory Education: All participants in strategic IT decision making will require (different kinds of) education and training in the design principles of the Framework. They will need to understand its dialectical nature, and will require training in the dialectical approach to problem solving.

Available Education and Consultancy: The education, learning tools and techniques, and consultancies available in South Africa should be surveyed and mapped to the principal organizational disciplines - organizational dialectic, organizational policy (business strategy), organizational design, organizational development, and organizational learning. What is already available, and what will be done about what is not yet available?

Stage Assessment: The present stage of development in both the business and the IT domains must be assessed, in order to validate the feasibility of the IT strategy and to determine what else must be done to make it feasible.

The stage of company development - in terms of utilization of resources, competitive/entrepreneurial mode, evolution of the planning system - will influence the way in which competitive strategy, organizational design and IT positioning are analyzed, and the business vision expressed in the IT positioning statement.

The stage of IT - in terms of Nolan stages theory, maturity of capacity planning, maturity of applications development - determines the kind of target environment architecture the company can reasonably expect to implement.

Formal Learning Systems: The first release of the learning systems the IT strategy will require must be developed and agreed, covering formal education and training as well as systems implicit in the control mechanisms.

Management of Innovation and Assimilation: Work must commence on establishing formal management processes and standards for innovation and innovators, and for the acquisition and assimilation of new technologies

B. Fit with the Overall Planning Process

To assist in understanding how the Framework would fit into a company's overall strategic planning processes, Figure 27 maps its major constructs to IBM's "EwIM Action Plan" [Benson & Parker, 1986(2) & (3)]. Many of the basic concepts of the present Framework derive from EwIM, and using the Action Plan should make it easier to bring future IBM offerings in this area to bear - for example, education for business executives, and facilitative expert systems.

1. Part I: Basic Concepts in Strategic Planning

Without exception, the first steps in any implementation of the Framework must be the Fundamental Agreements, the Introductory Education, and a survey of available methodologies, tools and techniques. Some initial education will be needed in order to discuss the fundamental agreements, and these will also depend to some extent on the outcome of the survey.

At the end of these steps, there should be a reasonably clear understanding of management's predisposition towards competitive behaviour and alignment IT strategy or entrepreneurial behaviour and impact IT strategy. Their attitudes may change, but what they are initially will influence the way in which the Framework is implemented.

2. Part II: The Strategic Business Questions

If the predisposition is towards entrepreneurial behaviour and impact IT strategy, then the mandatory next steps are Dialectical Debate and the Environmental Data Scan, culminating in the Corporate IT Scenario(s). Senior managers from the business and IT domains must be involved.

When management is disposed towards competitive behaviour and alignment IT strategy, they may still decide to carry out these steps. Alternatively, more limited discussion and environmental analysis may be delegated to the corporate planning and IT R&D staff, in which case the Corporate IT Scenario will have to be submitted to senior management for approval.

The next step is to evaluate the current stage of company development, from the perspective of the business domain. When alignment IT strategy is contemplated, this task may be delegated to corporate planning staff and selected middle managers.

The next three steps are crucial - Competitive Strategy Analysis, Organizational Design Analysis, IT Positioning (IT strategy evaluation, IT investment focus, definition of competitive advantage). Unless they are done well, there would be no point in using the present Framework.

If senior management are not directly involved in the analyses, they must be briefed on what is being done. The resulting IT Positioning Statement must be explained in detail and agreed to by them. Indeed, the predisposition towards alignment or impact IT strategy could begin to change at this point, as opportunities and impacts begin to be understood.

Corporate planning and IT R&D staff, some IT planning staff, and some of the co-ordinating bodies, should be put in place during the course of the activities described in this Section. Learning systems cannot be developed this early, but it is both possible and necessary to begin identifying their design factors (Section 4.6.IV.A.).

3. Part III: IT - Strategic Planning Questions

The next step is to evaluate the current stage of company development, from the perspective of the IT domain. The task is essential whether alignment or impact IT strategy is being contemplated, but the risks are greater in the latter case. The task should be carried out jointly by business and IT domain professionals. The objectivity of the evaluation may be enhanced by employing an outside consultancy.

The initial activities relating to the four dimensions of the Target Environment Architecture (Section 5.II.A.3.) will be carried out concurrently, so that by this time virtually all the co-ordinating bodies and architectural staff should be in place.

4. Part IV: Implementation

Part IV runs in parallel with Parts II and III. This means that an analysis of the "organizational health" should be carried out at a fairly early stage - possibly even as part of obtaining the Fundamental Agreements. Its main practical benefit should be to determine the kinds of Co-ordinating Bodies and staff functions required.

The first Process, Commitment and Action Plans cover the initial activities required to get strategic IT decision making going in accordance with this Framework (Section 5.II.A.4.). Later plans will cover the substantive content of the IT strategy, and these will come into being as the Master Transition Plan unfolds and adapts according to the logic of the Framework.

Figure 27 adds an eighth question to the original EwIM seven - "How do we ensure ongoing success and development?". In this Framework, the answers lie in quantification and evaluation, control systems, accountability, and organizational learning systems.

III. EVALUATING THE ACCEPTABILITY OF THE FRAMEWORK

However much internal validity, intuitive appeal and operational acceptability an IT decision making framework may possess, the fact remains that there is as yet no known way of proving its efficacy, either in advance of acceptance, or after use:

> "No conclusive evidence exists to demonstrate that most [information systems strategic planning] processes might survive a critical cost-benefit evaluation. Empirical studies that examine the overall impact of such planning processes on business performance are just beginning to be performed. Procedures which are diagnostic in nature, and which therefore go beyond the issue of generally validating the merits of [information systems strategic planning] processes, have not yet been developed to any significant extent." [King, 1988: 103]

Moreover, Chakravarthy's [1987] research into the strategic planning systems of a number of diversified companies in the U.S.A. suggests that the criteria for assessing the goodness of fit between a planning system and the company using it are by no means obvious. He found, in the sample he surveyed, that:

> Managers' ratings of their strategic planning systems showed no significant correlation with the financial performance of their firms.
>
> The planning systems of the firms surveyed were for the most part lacking in both external fit (i.e. with the firm's business strategy and financial context) and internal fit (i.e. with the firm's organizational and cultural context).
>
> There was a poor relationship between planning system rating and the external and internal fits it enjoyed.
>
> There was a strong preference for having a control orientation in the planning system.
>
> The most important determinant of the rating of a planning system was its novelty (which could be attributed either to fad value or to the high hopes held for the new system).

A. <u>Direct vs. Indirect Evaluation</u>

It is proposed in this Study that, for the time being, persons responsible for establishing the strategic IT decision making processes of their companies should focus on what King [1983] calls "the direct approach to planning evaluation" - or, in the present context, to the evaluation of a decision making framework.

Indirect approaches attempt to evaluate the efficacy of planning systems by comparing various firms in terms of their performance as measured by profitability, growth, etc.

> "In effect, [they treat] the products of planning - the plan, the strategy which it entails, etc. - as a 'black box' that should be assessed solely in terms of the ultimate performance of the business". [King, 1983: 265]

King describes the limitations and deficiencies of such approaches, which are similar to the problems that arise in IT strategy field research (Section 2.II.A.). By contrast, direct approaches seek to evaluate the system on its own terms, in a detailed and comprehensive way:

> "A wide variety of benefits are claimed for planning by virtually all of its proponents [e.g. Steiner, 1969]. To fairly assess planning, the evaluator must assess the degree to which these diverse benefits are, in fact, achieved." [King, 1983: 266]C4

The following Sections describe an adaptation of King's two similar frameworks - the 1983 version for general strategic planning and the 1988 version for strategic IT planning - which can be used to evaluate, in advance, the likely acceptability of the present Framework to a specific company.

The evaluation framework shown in Figure 28 consists of the seven elements (boxes) described in this Section, and ten "evaluation points" described in the next Section. To avoid confusion, the evaluation framework will be referred to as the EF, and the decision making Framework to be evaluated as the DMF.

B. <u>Evaluation Precepts</u>

King [1983: 268-269; 1988: 105-106] describes five evaluation "precepts", which are applied in the present context as follows:

> <u>Multi-Dimensional Assessment</u>: It is neither necessary nor

desirable to reduce the various assessments of the Parts, Links, constructs and attributes of the DMF to a single overall measure. The overall evaluation can, however, be expressed in terms of a profile whose shape as well its evaluative dimensions will be informative.

Use of Both Internal and External Standards: The DMF should be evaluated in terms of the specific aims to which it will be applied in the company, in terms of generally accepted norms of good decision making practice, and in comparison with other competing frameworks.

Analysis of Multiple System Stakeholders: The DMF should be assessed in terms of the interests of strategic IT decision makers at all levels of participation in all decision making domains. Differences in the evaluations will in themselves constitute important information.

Use of Judgemental and Objective Assessments: As in the DMF , human judgement is the vital ingredient in the EF.

> "However, that judgement should not be merely impressionistic. Rather, it should be guided by a series of prescribed measurement points and prescribed assessments, which, although the details may vary from firm to firm, are rather generic in nature." [King, 1988: 106]

King & Rodriguez [1978] have described a variety of such assessments.

C. Elements of the Evaluation Framework

The elements of the EF are represented by the seven boxes and ten evaluation points shown in Figure 28. The boxes are as follows:

Information Input: This element of the EF represents the information required to be processed by the DMF in producing its decision outputs. Major categories of information are:

Internal and external environmental information.

Business information - company mission; planning ends; strategy; organizational structures and processes; business (action) plans.

IT information - the technology; suppliers and other external forces; available human resources; structure and management of the IT support organization.

Other important information about the company - critical success factors; SWOT analyses.

Resources Input: This box represents the human, financial, technological and other resources consumed in creating, using and maintaining the DMF.

Decision Making Aims: This element represents the specific aims to which the DMF will be addressed. These

> "might be as modest as attempting to develop a rational scheme for prioritizing the many computer applications development projects that are underway or proposed. Alternatively, they may be as broad as attempting to comprehensively plan for the future applications of computer, information and communications technology in various areas of the enterprise ..." [King, 1988: 104]

A basic thesis of Chapter 4 is that the successful application of IT may bring about changes in the competitive strategy of the company, and hence in the strategic purposes of the technology - e.g. a move from alignment IT strategy to impact IT strategy. In the same way, successful implementation of the DMF may bring about changes in the behavioural mode of the decision makers - e.g. from competitive mode to entrepreneurial mode - and hence in the basic rationale for the existence of the DMF.

The Decision Making Framework: This element represents the DMF, the entity to be evaluated. Since it encompasses the people making the decisions as well as the mechanisms they use, the DMF can in effect be viewed as the entity performing the decision making [cf. King, 1983: 267]. Evaluation should focus on the major constructs and initial activities reviewed in Section 5.II.

Decision Making Outputs: The output block does not merely represent the four major documents of the IT strategy, the Corporate IT Scenario(s), the IT Positioning Statement, the Target Environment Architecture and the Master Transition Plan, but rather their content and effect:

The business vision for the role of IT.

The IT positioning.

The emerging IT infrastructure, strategic business systems and human resources.

The way in which the transition plans are carried out and controlled.

As King [1988: 105] remarks, alternatives that were considered but not incorporated into the final plans should also be considered as an output of the DMF.

The Quadrants of IT Strategy: The final block denotes the ultimate effect of the strategic IT decisions made in accordance with the DMF. These are the measurable impacts of the outputs on the quadrants of IT strategy that prompted their creation in the first place.

The two quadrants of the business domain refer to competitive advantage, i.e. the gains in competitive position and organizational effectiveness achieved. The two IT quadrants refer to the development of the IT domain itself. These are the measurable ways in which the IT support organization has improved its support of the competitive strategy and organizational design, and made the company a more effective exploited of IT resources.

<u>External Norms and Practices</u>: External norms complement the internal standards of the company in evaluating the DMF. They refer generally to good decision making theory and practice in respect of any of the constructs of the DMF. The design principles set out in Section 4.1. are special instances of such norms. Also included here are good practices observed on the part of allies and strategic targets.

D. The Evaluation Method

The "evaluation points" shown in Figure 28 represent two sets of assessments, which collectively result in an evaluation profile of the DMF. Six assessments (A to F) are based on the internal characteristics of strategic IT decision making in the company, and four (G to J) on comparisons with norms and practices external to the company, e.g. comparisons with case histories and with whatever can be found out about what competitors are doing.

In addition to whatever hard data may be to hand, opinions can be obtained through questionnaires or interviews conducted in all four domains, with questions framed along much the same lines as those given used in the field survey of this Study (Appendix B). Systematic comparison of the opinions obtained from the different domains will be useful in making the assessments.

In each assessment the objective is to decide whether the DMF can bring about significant improvements in the company's strategic IT decision making practices, more cost-effectively than other available DMFs. In the following Sections, the assessments are characterized by questions that explicitly address at least one of the constructs reviewed in Section 5.II.

Section numbers 1. to 8. given in parentheses refer to the field survey findings discussed in Section 3.III.C., and suggest areas of particular importance in a South African company's evaluation.

1. Internal Evaluations

<u>Point A</u>: <u>Appropriateness of Decision Making Aims</u>: Will this DMF help in analyzing the many environmental issues facing the company and singling out the critical issues that require priority attention (Sections 3. and 4.)?

Will it help in arriving at decision making aims that are appropriate for this company (Section 5.)?

In particular, will it managers appreciate the importance of an external orientation in strategic IT decision making and better understand the aims of interactive planning and idealized design?

Does the company have, and will it provide, the resources needed - human, financial and technological - to pursue these aims in the comprehensive manner envisaged in this DMF? In particular, does it have sufficient numbers of development staff of the requisite calibre for the kinds and varieties of IT applications that are likely to emerge from the strategic plans (Section 1.)?

<u>Point B</u>: <u>Effectiveness of Decision Making</u>: Will the DMF fit in with and enhance whatever strategic decision making processes the company already has - for example, corporate

planning, information systems steering committee, systems strategy documents (Section 2.)?

Will it help managers agree and implement processes the company does not already have - in particular, good business/IT dialogue, IT R&D, IT-related O&M, focusing the IT investment, and quantifying the aggregate benefits (Sections 1., 2. and 5.)?

Will it lead to better understanding of the need to take perceptions and assumptions as well as data into account?

Will it help in achieving the identified decision making aims? Will it help in identifying opportunities that might otherwise have been overlooked, and in rejecting "opportunities" that should be avoided (Section 8.)?

Will it improve the quality and success of IT strategy proposals (Sections 5. and 7.), and the way these proposals are evaluated?

What improvement in the quality of IT support for the company's business plans can be expected from the use of this DMF, and how will this be measured?

Is the DMF's functional coverage adequate - in terms of areas participating as well as scope of the plans produced?

How effective will it be in generating company-wide strategic IT decision making in an organization where business functions are decentralized but IT decision making is still largely centralized (Sections 1. and 5.)?

Will the move towards decentralization of application-related tasks seen in many companies (Section 5.) provide a good starting point for introducing the concepts of the DMF?

<u>Point C</u>: <u>Role and Impact of the DMF</u>: Assessing the potential role and impact of the DMF needs to be especially careful in companies whose managers believe they are managing the issues well enough already (Section 3.).

The central question must be: will the outputs really be used to drive the actual decision making activity, or will they "gather dust on the shelf"? The answer lies as much in the prevailing culture of the company as in any attributes of the DMF and its outputs.

Will the DMF help managers strike a suitable balance in nurturing both creativity and control in the internal environment of the company? Chakravarthy [1987] and McGinnis [1984] identify a number of key elements that are instrumental in achieving this balance.

Will it help participants in strategic IT decision making accept commensurate accountability for the control of IT costs (Section 5.).

Will it encourage developers to move into the microeconomic aspects of requirements analysis, which seem to be missing in current methodologies and practice - for example, value chains and production functions (Sections 2. and 6.)?

In general, will it encourage them to make more/better use of available tools and techniques (Section 6.)?

Will this DMF (or any other, for that matter) encounter significant resistance in the company, especially if, as is likely, participative IT decision making is not already an accepted practice (Section 5.)?

Will the concepts of value chain analysis, competitive advantage calculations, and strategic business systems be understood and accepted (Section 2.)?

Will the DMF help improve the general understanding and organization of IT roles, tasks and responsibilities in the company? Will it overcome the effects of "organizational distance" from the business/IT decision making interface (Section 3.).

<u>Point D</u>: <u>Impact of the Decisions Made</u>: This is the key assessment - what impact are the outputs of the DMF likely to have on the four quadrants of IT strategy - competitive strategy, organizational design, technology positioning and the IT strategy itself?

It is also the most difficult assessment, since in many companies there are likely to be many differences of opinions and perceptions (Section 7.).

Following King's [1988: 108] line of reasoning, it would seem that when the decision making aim is alignment IT strategy (the company being in the Support or Factory Box of the Strategy Grid), the assessment will be most difficult to make. It will be easier when the aim is impact IT strategy (with the company in or moving into the Turnaround or Strategic Box), since in this case the role and expected benefits of IT are more sharply defined.

The overall evaluation of the DMF must include assessments of how well it is likely to help the company achieve these benefits. The same benefit calculation techniques proposed in the DMF should be used to assess the likely impact of the DMF on these benefits. King [1988: 109] suggests a useful sensitivity test - if the business strategy were to be changed in each of a number of specified ways, would the DMF generate significant changes in the IT strategy?

<u>Point E</u>: <u>Adaptive Value of the DMF</u>: The concepts of architectural levels and corresponding adaptive learning loops are fundamental to the DMF. Without it, directed

incrementalism would be infeasible, and target environment architecture would be yet another total planning approach, in the rationalist-comprehensive mold.

Hence the central question here is: will the company be able to develop practical and effective organizational IT learning systems as envisaged in this DMF, and will people really use them?

Will the DMF and its four outputs adapt in response to the impacts on IT strategy actually experienced? Will feedback extend, if necessary, to the aims of strategic IT decision making? For example, the DMF may have produced high-risk technical strategies for infrastructure and business system development. It may turn out that the strategies are difficult to implement and do not bring the expected gain in competitive advantage. Will the DMF then adjust its evaluation criteria, and will its aims change to, say, the generation of less risky alignment strategies?

<u>Point F</u>: <u>Strategic Congruence</u>: A primary aim in using this DMF is to achieve the three kinds of congruencies inherent in its definition of organizational dialectic - between competitive strategy and organizational design, between the distinctive competence of the company and the collective competence of the strategic IT makers, and between IT purposes and IT uses (Figure 4).

Will the DMF help in identifying the best strategic purposes for IT in relation to the company's industry and market, and organizational uses that will give effect to those purposes (Sections 3. and 8.). Will it provoke deeper thought into these issues on the part of strategic IT decision makers, and encourage them to undertake impact IT strategies when these are appropriate and feasible (Section 5.)?

2. External Evaluations

Point G: Relative Efficiency of the DMF: Will the resources - human, financial and technological - likely to be consumed in implementing this DMF be justified by the results assessed at Point D?

What is it "normal" to spend in this industry and this market? What are the company's allies and strategic targets spending? Will expenditure on the DMF be treated as organizational slack, to be cut substantially during periods of business down-turn?

How will the DMF itself contribute to its own efficiency - for example, through better structuring of decision making roles, tasks and responsibilities?

Point H: Relative Credibility of Decision Making Aims: Are the kinds of strategic IT decision making aims addressed by the DMF commonly regarded as suitable for this kind of company? The answer to this question will depend to some extent on the scale of the company, on its industry and market, and on the Boxes of the Strategy Evaluation Grid in which it currently is and/or intends to be.

Will the DMF help makers better discriminate among the different reasons why having an IT strategy should be important, and thus identify the company's Box(es) crisply and accurately (Section 5.).

Will it help them to understand the implications of long-term IT strategy, when this is what is needed, and to develop consistent approaches to the opportunity costs of building an IT infrastructure (Sections 3. and 5.)?

Point I: Relative Worth of the DMF: How does the DMF rate in terms of what the company considers to be good decision making practice?

How does it rate in terms of standards found in the management literature [e.g. Huber, 1980; Steiner, 1969] and in relation to other information systems planning frameworks?

Does it incorporate other well-known aids to decision making - e.g. Critical Success Factors technique, SWOT analysis, Cost, Benefit and Risk analysis? Does it rely on suitable on analytical techniques.

Does it give appropriate attention to auditing of the resources and competences available for carrying out the plans it will generate - human, financial and other?

How does it rate in terms of its own design principles? Will it help in creating and managing good organizational dialectic, or will it be regarded as too complex and theoretical for practical decision making, as the low response rates to the questionnaire survey seem to indicate (Section 1.)?

How does it compare with the systems used by allies and strategic targets?

<u>Point J</u>: <u>Relative Worth of the IT Strategy</u>: How will the outputs of the DMF rate in terms of whatever external standards for IT strategy are deemed important? For example, will they be appropriate to the stage of company development, in both the business and the IT domain?

IV. CONCLUSIONS

The major constructs of the Framework described in Chapters 4 and 5 do not differ in any radical way from those found in many conventional strategic planning frameworks. Their mapping to the four Parts of EwIM Action Plan further suggests that their mode of implementation should not pose severe problems in companies who have, or are willing to develop, adaptive planning systems.

The major features of this Framework that are likely to cause problems in accepting and implementing it are its emphasis on a holistic organizational dialectic, and its insistence on the incremental implementation of an essentially unreachable target environment. This will be partly a problem of understanding, and partly a problem of gaining commitment to the levels of effort and resource that are undoubtedly called for. Nevertheless, the conclusions drawn from the field survey discussed in Chapter 3 indicate that there is indeed a need for just such a Framework in the South African market.

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CHAPTER 6

CONCLUSIONS

I. THE FUTURE FOR IT STRATEGY IN SOUTH AFRICA

Although the subject matter of the proposed decision making Framework is specifically information technology, this Study has been at pains to emphasize that it would be a major error of judgment to concentrate only on the artifacts - the machines, tools, telecommunications, and even the application systems. At least equally as important as these for successful IT strategy are the political, social and economic factors in a company's external operating environment, and the organizational and cultural factors of its internal environment.

Hence the scope of strategic IT decision making as characterized in this Study is far wider than the issues of hardware, software and methodologies - it extends, indeed, to the underlying forces operating beneath the appearances of environmental change and turbulence, and the underlying beliefs and assumptions that determine the way these are taken into account in decisions. The first requirement in strategic IT decision making is to know what these forces and these assumptions are.

On the other hand, not everyone accepts the frequently made claim that IT will lead to fundamental changes in the entire social and economic fabric of the country. Even in the context of a single company, few respondents in the survey pool seemed ready to accept the validity of impact IT strategy - and perhaps not unwisely so.

Major world-wide trends in IT today include:

Dramatically reducing cost relative to other technologies and to human labour, and dramatically increasing functionality and power.

The merging of hitherto separate information technologies - data processing, telecommunications, office automation, robotics, and so forth.

The ever-improving ease of operation of the systems, through increased sophistication of the software and the human interface - for example, through the use of artificial intelligence.

These trends taken together mean that IT has become a daily fact of life across a wide spectrum of technical and non-technical people, in the First World and to an increasing extent even in the Third World. People now expect a sophisticated IT component in almost any product or service, from arcade games and motor cars to medical care and financial services.

The present political and economic uncertainties make it unlikely, however, that these developments will influence South African business strategies to anything like the extent that they have done and will yet do overseas. There are a several reasons why South African managers' expectations should be cautious:

The notorious scarcity of specialist IT skills throughout the world is a particularly daunting problem in South Africa, given the inadequate education of the vast majority of the youth of this country and the considerable legal, regulatory and attitudinal obstacles in the way of doing anything about it.

The country's geographic isolation from the top thinkers and planners in the fields of business and IT strategy becomes more of a problem as these people become less willing or able to visit (or to receive) South Africans.

There is the very real danger of mandatory sanctions on hardware and software exports to this country, and large corporations are already "buying forward". It is one thing for a company to be denied access to technologies when the competition is similarly denied, but quite another when the competition gets in early enough and only the company is denied. Worst is for a company to find its supplies and maintenance cut off once it has committed to a technology.

In South Africa, it will probably be those companies who best evaluate the opportunities and risks, build an environment in which to assimilate and exploit judiciously chosen technologies, and carefully husband their scarce resources, that will achieve significant and sustainable competitive advantage from IT. The question remains, however, whether even the cautious and the doubting Thomas's can afford to ignore the message of the competitive weapon stories, and risk the possibility of being reduced, as Warren McFarlan would put it, to "playing catchup".

In this country, management would be wise to satisfy itself on four fundamental issues before it embarked on IT-based business strategies:

Firstly, the company generally and its IT function in particular should already have reached an appreciable level of competence and cooperation in applying IT in the traditional support-orientated ways.

Secondly, achieving a favourable political, social and economic environment will entail a far more interactive involvement by businessmen in the political and social fields than most seem willing to undertake.

Thirdly, management will have to bring itself to an explicit acceptance of the entrepreneurial mode of strategic behaviour, and encourage corresponding attitudes at all levels of decision making in the company. Wiseman [1985: 179-180] sums up this issue in three principles of "strategic IT vision":

> The general purpose of the firm is to organize the use of the resources at its disposal so that it can achieve its long-term profitability and growth goals.
>
> The range of possible uses of the resources at the firm's disposal is limited only by the experience, knowledge, and imagination of its employees.
>
> Entrepreneurs are responsible for identifying new, productive uses of the resources at the firm's disposal.

Finally, the entrepreneurial attitude to IT is frankly opportunistic, and the traditional paradigm of "user needs" is absorbed into a more general schema of domain responsibilities in which owner purposes are predominant. The question must then be asked as to how it will be ensured that a company uses its new "competitive weapons" - whose full power it has not even begun to understand - in the best interests of the society which sanctions its existence. What is good IT strategy in Europe or the United States is not necessarily good in Asia or Africa.

For these if for no other reasons, a new perspective on strategic IT decision making as advocated in this Study is urgently needed in South Africa. The ways in which this Study and the decision making Framework that it proposes aims to contribute to the new perspective are summarized in the following Section.

II. THE CONTRIBUTION OF THE FRAMEWORK

Figure 29 indicates eight themes through which the Framework encourages a shift in IT management thinking from the traditional modes to new, more interactive modes:

<u>IT Positioning</u>: Most traditional IT planning efforts result in alignment IT strategy. At least insofar as IT decision making is concerned, the mode of business strategy tends to be competitive rather than entrepreneurial, and the business planning approaches are at best preactive. Virtually all the IT planning tools and techniques in current use aim at fulfilling identified "user needs" in existing organizational structures and processes, in support of predetermined business strategies.

The Framework, however, emphasizes the choice management has between alignment and impact IT strategy, depending on its circumstances as expressed in terms of the strategy evaluation grid. It shows how, in applying IT to change the strategy and design of the company, management can define and calculate the competitive advantage it hopes to gain by this, where it should focus its investment in human, financial and technological resources, and how to identify technologies appropriate to these aims. The messages of the competitive weapon stories thereby become feasible propositions for many companies.

<u>Master Strategy</u>: The traditional emphasis on alignment IT strategy and on the quantification of benefits in terms of cost displacement leads to a focus on cost leadership strategy, whether or not this happens in reality to be the company's master strategy.

The Framework, however, emphasizes the fact that a company has many choices of master strategy. Any of these can be considered in strategic IT decision making, and there are many choices of targets towards which the strategy can be directed.

Purposes and Uses of IT: The presumption of cost displacement and task and process efficiency as the strategic role of IT resulted, until fairly recently, in an almost exclusive focus on management information, decision support, data processing, and job or process automation as appropriate terms of reference in requirements planning.

In the Framework, however, these concepts become secondary, the primary considerations being the specific purposes of the applications in competitive strategy and their levels and classes of use in organizational design. Three different kinds of application can be identified - substitutive, complementary and innovative - and their costs justified in terms of quite different kinds of strategic benefit.

It is no longer possible, in this perspective, to perpetuate the traditional separation of information systems design from the design of the organizational processes they are meant to support.

Orientation of Applications: The traditional contribution of IT to organizational design has an internal orientation, and applications are selected on the basis of the known past and present needs of existing tasks and processes. Neither the effectiveness of these tasks and processes in achieving the organizational ends nor their alternative configurations are usually discussed.

The value chain approach proposed in the Framework emphasizes both the internal structure of the organization and its external linkages with other organizations. By exposing underlying generic organizational structures and processes as the true entities supported by information systems, it leads to a better understanding of potential future needs.

<u>Issues of IT Organization</u>: Traditionally, the issues of information systems organization revolve round whether or not to "decentralize" some or all of the functions to the business units and functional departments of the company.

In the Framework, these are deemed to be implementation issues, if they are strategic at all, and they are appropriate to the macro- and micro-architectural levels of discourse. Generic IT support functions that arise out of the Target Environment Architecture are, however, matters of IT strategy. They enter the organizational dialectic in much the same way as the generic organizational processes that are uncovered in strategic business systems analysis. Contradictions between them and the existing information systems organization must be discussed at the conceptual and meta-architectural levels, and resolved in terms of the fundamental concepts of differentiation and integration.

<u>Approaches to Problem Solving</u>: Conventionally, problem solving in IT practice has been rooted in the passionless logic of the flowchart. Contradictions in ends, ways and means are errors to be avoided or eliminated, and conflicts of attitude and approach must be resolved through consensus and compromise.

The dialectical logic advocated in the Framework has as much to do with imagination as rationality. Contradictions are regarded as a step in the analytical process, and are actively sought as the source of new perceptions, novel approaches, and innovative opportunities. Participative decision making and dialectical debate emphasize synthesis rather than compromise, and seek to direct conflict into healthy, productive channels by carefully clarifying roles and depersonalizing sensitive issues.

<u>Methodologies</u>: The old internal orientation of IT applications has been well served by the closed-system and "rational-comprehensive" character of traditional IT planning methodologies. Requirements have been correctly and precisely determined, at least in principle, and implementation has followed as efficiently as the competence of available personnel permitted. The understanding of "requirements", however, has been limited, relying as it has usually done on past and present needs as perceived by actors within the system.

The Framework has an open-system orientation in several respects:

Its levels of incremental implementation and adaptive learning, which imply continual response to changes in the environment.

Its reliance on value chain and value system analysis, which implies that the company and its IT strategy are planned in the context of a larger whole.

Its nature as an open tool-box rather than a set of prescribed tools and techniques, which means that users are encouraged to seek out and use whatever decision making aids are suitable and available, or may in future become available.

The five "principle disciplines" underlying the Framework are all well-recognized fields of expertise, in which trained educators, consultants and facilitators are readily available in South Africa. While the Framework does not claim to be a methodology, it is a means of integrating these disciplines into a credible and practical support system for strategic IT decision making in a specific company.

<u>Paradigm</u>: Finally, all of the above differences are summed up by the shift in the over-arching criterion for strategic requirements - from the sovereignty of "user requirements" to the "mutual responsibility" shared by four distinct but cooperating domains of strategic IT decision makers.

There are, however, pitfalls to be avoided in embracing the new paradigm. Although maximum appropriate involvement of users and operators in transforming the systems within which they are expected to work is certainly an ideal of the Framework, nevertheless a fundamental error owners and developers must avoid is "bowing to spontaneity" - to fads, to the unproven "insights" of enthusiastic users, to new, exciting, but untested technologies, and to a demand for systems and system changes whose relationship to the agreed purposes and uses of IT has not been demonstrated.

The greater and more widespread the upsurge of user and operator involvement, the incomparably greater and more complex the need for competence and control in managing the theoretical, technical, political, and cultural strands of IT strategy. But clinging to the outworn structures of earlier stages of development - e.g. rigid centralization of information systems functions, and inflexible budgetary control - is not an appropriate dialectical response.

It could be argued [cf. Churchman & Schainblatt, 1965] that one of the major causes of the rift between business and IT thinking in traditional strategic decision making has been a certain arrogance on both sides. There is a tendency for many IT people to believe that, because they think rationally and clearly in their own field, they can think rationally and clearly in any decision making situation. Many business people, on the other hand, seem to believe that IT people do not have the "gut feel" for business problems, or enough experience of the "real world" to contribute more to strategic thinking than commentary on technical feasibility.

At the same time, the typical IT planning methodology seems to have been based on the premise that a certain kind of reasoning must prevail, and that once this way of thinking has been made clear the problem analysis and the proposal that results from it will be understood and accepted by all who are neither negligent nor stupid. Business people, for their part, seem to believe that their goals and problems are so complicated, so elusive, so creative, that they must forever remain beyond the reach of anything so simplistic as a methodology.

It is hoped that the shift in management thinking exemplified in the above eight themes will result in the owners and users of the business domain coming to a better understanding of what drives IT people, and a better appreciation of the role they can play in strategic decision making. It is hoped that the developers and operators of the IT domain will learn more about the objectives and priorities of business people, possibly by emulating them in learning how to manage DP as a "business within a business" [Nolan, 1982: 237].

In these circumstances, it is not unreasonable to expect that many tasks in the business and IT domains will eventually draw closer together, and that Churchman & Schainblatt's [1965] "mutual understanding" position will eventually become the organizational and cultural norm. This would rank among the most significant contributions the Framework can make to strategic IT decision making practice in South Africa.

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APPENDIX A

COMPANIES SURVEYED

Business Sector	Company Name	CUC Member Class	Usable Responses Received
1	Allied Building Society	A	A B C
1	Bankorpdata	A	C
3	BP Southern Africa	A	C
3	Caltex Oil	A	A B C
1	Commercial Union Assurance	B	C
4	Edgars Stores	A	A B C
2	Escom	A	A B C
1	First National Bank	A	B C
4	Foschini	A	A B C
1	Johannesburg Stock Exchange	A	A B C
2	Kanhym	B	A B C
1	Metropolitan Homes Trust	A	A B C
3	Mobil Oil	A	A B C
1	Mutual & Federal	B	A B C
2	Nissan SA	A	A B C
4	OK Bazaars	A	A C
1	Old Mutual	A	A B C
2	S.A. Nylon Spinners	B	C
1	S.A. Reserve Bank	A	A B C
5	S.A. Transport Services	A	A B C
1	Santam Versekering	A	A B C
3	Shell South Africa	A	A B C
2	Smithdata	B	C
1	Southern Life	A	A B C

2	Toyota Marketing Company	B	A B C
1	United Building Society	A	A B C
1	Volkskas	A	A B C
4	Wooltru	A	A B C

Business Sector:
1 = Finance
2 = Industry
3 = Oil
4 = Retail
5 = Transport
6 = Mining
7 = Bureau

Membership Class:
A = 1 to 9 DP employees
B = 10 to 49 DP employees
C = 50 or more DP employees

Response Type:
A = Business person, no IT involvement
B = Business person involved in IT
C = IT person

Summary

Members polled:	
Useable returns	28
Unuseable return	1
Declined to participate	4
No responses received	47
Members not polled:	
Government departments, suppliers, education, training, personnel agencies	44
Total Membership: November, 1987	124

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APPENDIX B

THE SURVEY QUESTIONNAIRE

This Appendix shows the Survey Questionnaire and the covering letter under which it was sent out. It will be seen from the latter that three versions of the questionnaire were sent to each company, although only version "C" is shown here.

The three versions are as follows:

A: Question 1: "I am not an IT professional, and have little or no involvement in IT decisions"

Other questions included: 28 - 91; 108 - 173; 181 - 188.

B: Question 1: "I am not an IT professional, but I am involved in strategic IT decisions"

Other questions included: 12 - 188.

C: Question 1: "I am an IT professional, and I am involved in strategic IT decisions"

Other questions included: all, i.e. 2 - 188.

Stationery of <u>COMPUTER USERS COUNCIL OF SOUTH AFRICA</u>

November 1987

Dear

<u>INFORMATION EXCHANGE PROGRAMME</u>

Attached to this letter you will find three copies of a survey questionnaire, dealing with:
"<u>STRATEGIC IT DECISION MAKING IN SOUTH AFRICA</u>".
This is the first project in our new Information Exchange Programme, which was announced at our Annual General Meeting on Friday, 20th November.

I am convinced that you will find both the results and the questionnaire itself interesting and useful, and that your time and effort will be well justified. If you would like a copy of my list of references to the strategic IT planning literature, I will happily send it to you - just indicate accordingly at the end of the questionnaire.

Please, may I very earnestly ask you to support this exercise? The more responses we receive, the more useful and reliable the results will be. The returns will be treated with the strictest confidence, and will not be shown to anyone outside of the small research team without your express permission. In this connection, I must also add that the survey forms part of my research work towards the Master of Commerce Degree in Business Data Processing at the University of Cape Town.

The three copies of the questionnaire are marked "A", "B" and "C". Would you please have each filled in, separately and without discussion, by an appropriate person as indicated on the front page. These should be people who have some insight into the company's business, but who do not have strong hobby-horses or biases that are not typical of management in your company.

Could the completed forms please be returned to me, at my home address, before you break for the Seasonal holidays, or before the end of December at the latest? My home address is: 14 Juliana Veld South, PINELANDS, 7405. If you would like to ask me anything, I can be contacted at (021) 509-2037 (Office) or (021) 53-1713 (Home).

May I thank you in advance for your valued participation in this exercise, and offer you my sincere good wishes for Christmas and the New Year.

Yours faithfully,

A.R. Hoffman
Vice President

SURVEY QUESTIONNAIRE - "C"

Strategic IT Decision Making in South Africa

Introduction

This is a survey of strategic decision making roles and practices in South African companies, with regard to IT (information technology and systems). It covers both the use of IT in business strategies, and the long-term technical strategies for managing IT.

The survey is a project in the Information Exchange Programme of the Computer Users Council of South Africa, and the findings will be presented to members as one of the benefits of membership.

Instructions

Please answer the "box" questions by ticking the box you believe gives the best answer, or by entering a rating as requested. You are welcome to add further detail or to mention any difficulty in interpreting the questions.

There are many roles in strategic IT decision making, at all levels of the company. It is assumed that the following is a reasonable description of yours:

I am an IT professional, and I am involved in strategic IT decisions [C] 1

This is an opinion survey - there are NO right or wrong answers. Whatever your opinions may be, they are important input to the research.

The following are key organizational characteristics. For each enter your best guess at the information requested, or tick the box that most nearly fits the facts.

Company's name [ ] 2

Your industry [ ] 3

Size of your company relative to the rest of your industry

small	medium	large

4

Total number of employees:

The entire company [ ] 5

Computer operations, e.g. operators, technical support [ ] 6

Systems development, e.g. analysts, programmers, data base administrators [ ] 7

Company organization structure

Single unit
Multiple business units/ profit centres
Other ....

8

IT organization structure

Single unit
Central computer operations plus decentralized systems development departments
Central systems development department plus decentral-ized computer operations
Other ....

9

Approximate total IT/DP budget (current financial year):

Capital expenditure [R] 10

Operating expenses, including depreciation, if any [R] 11

Please tick YES or NO in answer to the following questions, whichever seems closest to the facts about your company.

Is there a formal corporate planning and/or environment scanning process in your company?	Y	N	12
Is there a company-wide IT decision making process of any kind?	Y	N	13
Is there formal interaction between these two processes, e.g. joint meetings, reports?	Y	N	14
Is the cycle over which senior management try to control the growth of IT costs 2 years or longer?	Y	N	15
Is the overall strategic benefit of IT, in company-wide terms, measured and evaluated in any way?	Y	N	16
Taken over the last, current and next (projected) financial years, is the overall level of IT expenses growing at a greater rate than gross sales revenue?	Y	N	17
Are IT development costs charged back to users, either wholly or in part?	Y	N	18
Are running costs of operational IT systems charged back to users, either wholly or in part?	Y	N	19
Are the benefits and/or risks of particular IT applications and projects evaluated in any way?	Y	N	20
Does your company have a documented IT strategy and/or an information systems architecture?	Y	N	21
Does your company have a senior executive steering committee for IT?	Y	N	22
Does the company have special posts to co-ordinate all the various facets of communication between IT and the users, e.g. "account executives"?	Y	N	23
Has a "senior technology officer" or "IT R&D" post been created separate from the day-to-day data processing responsibilities	Y	N	24
Does your company have "business analysts" or O&M people who look at office workflows and job designs as they relate to the computer systems?	Y	N	25
Do you have "user-programmers" on your mainframe and/or an "information centre" approach to hands-on mainframe computing services for users?	Y	N	26
Are personal computers used extensively, or are they likely to become so?	Y	N	27

What is your opinion regarding each of the following strategic issues? Please give your answer in two parts, as follows:

Rate the importance of each issue to your company, on a scale of 1 (least important) to 10 (most important).

For those scoring over 5, rate how well the company manages it, using this scale: -2 = very poorly, -1 = less than adequately, 0 = adequately, +1 = better than average, +2 = very well

	Rating	How Managed Very Poorly .... Very Well	
Contingency plans against environmental threats, e.g. political action, security, disaster	☐	-2 | -1 | 0 | +1 | +2	28
Co-operating with SAPO in developing the national telecommunications services	☐	-2 | -1 | 0 | +1 | +2	29
Participating in bodies such as the Computer Society, Computer Users Council	☐	-2 | -1 | 0 | +1 | +2	30
Vendor relations and reliability of technology supply sources	☐	-2 | -1 | 0 | +1 | +2	31
Making better use of IT to gain or maintain competitive advantage	☐	-2 | -1 | 0 | +1 | +2	32
Defining and measuring the IT contribution to business objectives	☐	-2 | -1 | 0 | +1 | +2	33
Increasing the scope/pace of office or factory automation	☐	-2 | -1 | 0 | +1 | +2	34
Developing better management information and/or decision support systems	☐	-2 | -1 | 0 | +1 | +2	35
Developing better systems links with other organizations	☐	-2 | -1 | 0 | +1 | +2	36
Exploiting new technologies, e.g. image, expert systems, voice/data integration	☐	-2 | -1 | 0 | +1 | +2	37
Developing a company-wide IT infra-structure to integrate diverse techno-logies (data, voice, image, etc.)	☐	-2 | -1 | 0 | +1 | +2	38
Shortening the time it takes to develop new application systems	☐	-2 | -1 | 0 | +1 | +2	39
Improving the quality of operational systems and services	☐	-2 | -1 | 0 | +1 | +2	40
Utilising better software development tools and techniques	☐	-2 | -1 | 0 | +1 | +2	41
Adapting office systems and jobs to make the most effective use of IT	☐	-2 | -1 | 0 | +1 | +2	42

Drastically reducing the amount of paper handling in the company	☐	-2 | -1 | 0 | +1 | +2	43
Managing data as a company-wide (or business unit) resource	☐	-2 | -1 | 0 | +1 | +2	44
Developing a company-wide (or business unit) applications portfolio	☐	-2 | -1 | 0 | +1 | +2	45
Promoting more end-user computing, on mainframes and/or micros	☐	-2 | -1 | 0 | +1 | +2	46
Increasing the use of packaged software instead of inhouse programming	☐	-2 | -1 | 0 | +1 | +2	47
Developing and retaining skilled IT human resources	☐	-2 | -1 | 0 | +1 | +2	48
Measuring and controlling costs, benefits and risks of IT projects	☐	-2 | -1 | 0 | +1 | +2	49
Measuring the effectiveness of IT management and technical staff	☐	-2 | -1 | 0 | +1 | +2	50
Taking better account of strategic IT issues in business planning processes	☐	-2 | -1 | 0 | +1 | +2	51
Developing IT organizational structures and clarifying decision making roles	☐	-2 | -1 | 0 | +1 | +2	52
Controlling the overall level and rate of increase of IT costs	☐	-2 | -1 | 0 | +1 | +2	53
Learning from experience to make better strategic decisions concerning IT	☐	-2 | -1 | 0 | +1 | +2	54
Learning how to identify and assimilate relevant technologies into the company	☐	-2 | -1 | 0 | +1 | +2	55
Improving the quality of the dialogue between business and IT management	☐	-2 | -1 | 0 | +1 | +2	56
Building IT management disciplines and technological leadership skills	☐	-2 | -1 | 0 | +1 | +2	57
Other: ____________________	☐	-2 | -1 | 0 | +1 | +2	58
____________________	☐	-2 | -1 | 0 | +1 | +2	59
____________________	☐	-2 | -1 | 0 | +1 | +2	60
____________________	☐	-2 | -1 | 0 | +1 | +2	61

How far would you agree with the following statements about the importance of making good IT decisions in your company?

-2 = strongly disagree -1 = disagree 0 = not really sure
+1 = agree +2 = strongly agree

	Strongly Disagree .. Strongly Agree	
The survival and growth of our company depend critically on our existing operational systems	-2 | -1 | 0 | +1 | +2	62
The survival and growth of our company depend critically on our developing new applications	-2 | -1 | 0 | +1 | +2	63
Effective IT support in our company requires meticulous capacity and operational planning	-2 | -1 | 0 | +1 | +2	64
Providing strategic IT capability in a company such as ours demands a long term planning effort, at least three years into the future	-2 | -1 | 0 | +1 | +2	65
Achieving company goals demands a high standard of two-way dialogue between our business planners and our IT planners	-2 | -1 | 0 | +1 | +2	66
Good IT decisions need some input from our business planners, but company goals are not critically dependent on IT constraints	-2 | -1 | 0 | +1 | +2	67
We can develop IT capabilities that will alter our company's mission and objectives	-2 | -1 | 0 | +1 | +2	68
In a company such as ours, strategic IT decision making should be formalized, with clear-cut goals, processes and criteria	-2 | -1 | 0 | +1 | +2	69
Developing an IT infrastructure is a matter of strategic capability, which can and should be addressed in advance of specific applications	-2 | -1 | 0 | +1 | +2	70
A carefully thought out picture of some ideal future computing infrastructure is the only basis on which to build an IT strategy	-2 | -1 | 0 | +1 | +2	71
The only practical way to implement an IT strategy is piece-by-piece as needs emerge, building on what the company already has	-2 | -1 | 0 | +1 | +2	72
The best way to get good IT decisions is to involve as many people as possible, whatever the extra time and effort this requires	-2 | -1 | 0 | +1 | +2	73
A good IT strategy must start with company objectives and the purposes served by IT in that context	-2 | -1 | 0 | +1 | +2	74
A good IT strategy exploits any feasible IT opportunity, whatever the company mission may be	-2 | -1 | 0 | +1 | +2	75

How far would you agree with each of the following statements about the quality of IT decision making in your company?

-2 = strongly disagree -1 = disagree 0 = not really sure
+1 = agree +2 = strongly agree

	Strongly Disagree .. Strongly Agree	
We are doing little to cover ourselves against significant environmental threats	-2 | -1 | 0 | +1 | +2	76
Our business managers give little or no sense of direction to our IT planning	-2 | -1 | 0 | +1 | +2	77
Our IT managers have a poor grasp of the nature of our business and our strategies	-2 | -1 | 0 | +1 | +2	78
Our current operational systems meet their business objectives very well	-2 | -1 | 0 | +1 | +2	79
Almost all the application systems we need are already in place	-2 | -1 | 0 | +1 | +2	80
Our application system designs are well suited to the office systems and jobs they support	-2 | -1 | 0 | +1 | +2	81
Our IT team is reasonably stable - levels of turnover and vacancy are tolerable	-2 | -1 | 0 | +1 | +2	82
Most of our IT managers are competent and experienced	-2 | -1 | 0 | +1 | +2	83
Most of our IT technical staff are competent and experienced	-2 | -1 | 0 | +1 | +2	84
We have had few if any major systems failures over the last two years	-2 | -1 | 0 | +1 | +2	85
Very few people, outside IT, really understand the opportunities and planning issues of IT	-2 | -1 | 0 | +1 | +2	86
We lag behind the rest of the industry in our exploitation of strategic IT opportunities	-2 | -1 | 0 | +1 | +2	87
We do not have the technical and managerial skills to develop inter-organizational systems	-2 | -1 | 0 | +1 | +2	88
We invest a satisfactory level of human and financial resources in researching new technologies and opportunities	-2 | -1 | 0 | +1 | +2	89
We already have effective ways of measuring the overall IT contribution to our strategic goals	-2 | -1 | 0 | +1 | +2	90
We already have effective ways of measuring IT management effectiveness	-2 | -1 | 0 | +1 | +2	91

How centralized/decentralized is participation in strategic IT decision making in your company?

VC = very centralized C = somewhat centralized B = balanced
D = somewhat decentralized VD = very decentralized

Selecting mainframe computers and related hardware	VC	C	B	D	VD	92
Selecting terminals, personal computers, other "personal" equipment	VC	C	B	D	VD	93
Determining the scale and geographic scope of the data communications network	VC	C	B	D	VD	94
Selecting mainframe software, e.g. the operating system, database, languages	VC	C	B	D	VD	95
Selecting application packages, e.g. payroll, general ledger	VC	C	B	D	VD	96
Analysing data and designing the files and databases	VC	C	B	D	VD	97
Application systems - selecting, justifying and prioritizing	VC	C	B	D	VD	98
Application systems - analysis, design, programming, testing	VC	C	B	D	VD	99
Deciding on the operational computer services - schedules, response times	VC	C	B	D	VD	100
Establishing access controls and other security measures (all kinds)	VC	C	B	D	VD	101
Adapting and/or standardizing office systems and jobs to match the computer systems	VC	C	B	D	VD	102
Deciding on the overall level of mainframe and disk capacity	VC	C	B	D	VD	103
Deciding on the appropriate overall level of IT costs	VC	C	B	D	VD	104
Forecasting future business volumes and needs for capacity planning purposes	VC	C	B	D	VD	105
Technology research and development projects; liaison with vendors	VC	C	B	D	VD	106
Formulating the company's overall IT strategy	VC	C	B	D	VD	107

The following are common tools and techniques available to help in strategic IT decision making. What do you know of them?

? = Never heard of it
H = Heard of it, but never used it
T = Tried it, but did not find it useful
U = Found it moderately useful
VU = Found it very useful

Brainstorming	?	H	T	U	VU	108
Business strategy model (any)	?	H	T	U	VU	109
Business Systems Planning (BSP) [IBM]	?	H	T	U	VU	110
Cost/benefit evaluation model (any)	?	H	T	U	VU	111
Critical Success Factors [Rockart]	?	H	T	U	VU	112
Environmental scanning (any)	?	H	T	U	VU	113
Feasibility studies (any)	?	H	T	U	VU	114
Financial modelling (any)	?	H	T	U	VU	115
Nolan Stages Theory	?	H	T	U	VU	116
Nominal group technique	?	H	T	U	VU	117
PERT, Critical Path Scheduling or similar	?	H	T	U	VU	118
Porter "strategic forces"	?	H	T	U	VU	119
Porter "value chain" analysis	?	H	T	U	VU	120
Project management system (any)	?	H	T	U	VU	121
Service level agreements between operations and users	?	H	T	U	VU	122
Strategy set transformation [King]	?	H	T	U	VU	123

Tetrarch [Comcon]	?	H	T	U	VU	124
User Needs Survey [Alloway/Butler Cox]	?	H	T	U	VU	125
Other: ______________________	?	H	T	U	VU	126

The following are some lesser known tools and techniques.
What do you know about them?

Application portfolio [Nolan]	?	H	T	U	VU	127
BIAIT Enterprise Analysis	?	H	T	U	VU	128
B+OL+D Methodology [Online People]	?	H	T	U	VU	129
Business Information Control Study (BICS) [IBM]	?	H	T	U	VU	130
Change management process (any)	?	H	T	U	VU	132
Customer Resource Life Cycle [Ives]	?	H	T	U	VU	133
Enterprise Survey [Hansen]	?	H	T	U	VU	134
Enterprise-wide Information Management (EwIM) [IBM]	?	H	T	U	VU	135
Executive Planning for Data Processing (EP/DP) [IBM, Canada]	?	H	T	U	VU	136
Innovation management technique (any)	?	H	T	U	VU	137
IS Strategic Grid [McFarlan]	?	H	T	U	VU	138
IS Model and Architecture Generator (ISMOD)	?	H	T	U	VU	139
Org. Information Requirements Analysis [Wetherbe/Davis]	?	H	T	U	VU	140
Portfolio risk analysis [McFarlan]	?	H	T	U	VU	141
Priority setting method (any)	?	H	T	U	VU	142

Overall, how successfully do you think your company's IT decision making meets the following criteria?

-2 = very poorly   -1 = less than adequately   0 = adequately
+1 = better than average   +2 = very well

	Very poorly .... Very well	
Results in a significant reduction or containment of operating costs or headcount	-2 -1 0 +1 +2	143
Results in a significant increase in turnover or profit margin	-2 -1 0 +1 +2	144
Results in a great improvement in the quality of our products or services	-2 -1 0 +1 +2	145
Results in a good image of our company as an effective user of "high tech"	-2 -1 0 +1 +2	146
A major factor in our gaining or retaining market share	-2 -1 0 +1 +2	147
A major reason for our reaching our goals for company growth	-2 -1 0 +1 +2	148
A major factor in our reaching our targets for the overall return on capital employed in the company	-2 -1 0 +1 +2	149
Successfully co-ordinates many participants, from many backgrounds, and gets them to reach consensus	-2 -1 0 +1 +2	150
Creates a high quality of dialogue between the business planners and the IT specialists	-2 -1 0 +1 +2	151
Sorts out and clarifies the diverse issues of IT strategy and how they inter-relate	-2 -1 0 +1 +2	152
Expedites decision making so well that we can develop or change our systems quickly in response to market needs	-2 -1 0 +1 +2	153
Results in excellent understanding between the users and the people who manage our ongoing operational services	-2 -1 0 +1 +2	154

What is your opinion regarding each of the following purposes for which your company could use IT strategically? Please give your answer in two parts as follows:

Rate the likelihood of each purpose as an area of opportunity, on a scale of 1 (least likely) to 10 (most likely).

For those scoring over 5, rate how well the company exploits it using this scale: -2 = not at all, -1 = perhaps a little, 0 = adequately, +1 = reasonably well, +2 = very well

	Rating	How Exploited Not at all ..... Very Well	
Create value-added features in our products or service, the "marketing mix"	☐	-2 | -1 | 0 | +1 | +2	155
Make it more difficult for our customers or distributors to switch from us	☐	-2 | -1 | 0 | +1 | +2	156
Enable us to become the low-cost market leader	☐	-2 | -1 | 0 | +1 | +2	157
Enable us to forward-integrate into our distribution chain	☐	-2 | -1 | 0 | +1 | +2	158
Encourage our suppliers to compete aggressively for our business	☐	-2 | -1 | 0 | +1 | +2	159
Encourage suppliers to conform with our production schedules, e.g. "kan-ban"	☐	-2 | -1 | 0 | +1 | +2	160
Make it easier for us to switch our business among suppliers	☐	-2 | -1 | 0 | +1 | +2	161
Enable us to backward-integrate into our supply chain	☐	-2 | -1 | 0 | +1 | +2	162
Significantly distinguish our product, service, image, from our competitors	☐	-2 | -1 | 0 | +1 | +2	163
Enable us to organize and administer our company much more effectively than our competitors	☐	-2 | -1 | 0 | +1 | +2	164
Make it difficult for our existing competitors to gain access to our customers	☐	-2 | -1 | 0 | +1 | +2	165
Discourage new entrants to our market, by raising the minimum level of investment in systems and services	☐	-2 | -1 | 0 | +1 | +2	166
Discourage new entrants to our market, by delivering a product or service that is very hard to emulate	☐	-2 | -1 | 0 | +1 | +2	167

Discourage new entrants to our market, through exclusive networks and joint services with existing players	☐	-2 -1 0 +1 +2	168
Discourage substitutes for our products, by creating a comprehensive range of integrated products and services	☐	-2 -1 0 +1 +2	169
Discourage substitutes for our products, by maintaining highly competitive price/performance	☐	-2 -1 0 +1 +2	170
Discourage substitutes for our products, through networks and joint services with companies producing related products	☐	-2 -1 0 +1 +2	171
Other: ______________________	☐	-2 -1 0 +1 +2	172
______________________	☐	-2 -1 0 +1 +2	173

The following are some of the uses of IT that can be applied to the above strategic purposes. Using the corresponding question numbers (155 to 173), indicate which use would be best applied to the strategic purposes you rated more than 5.

Example: Inter-organizational systems [158, 171]

Automation of office processes	☐	174
Automation of factory processes	☐	175
Automation of controls	☐	176
Inter-organizational systems	☐	177
Professional support, e.g. CAD	☐	178
Automating the client interface, e.g. automatic teller machines	☐	179
Management information and/or decision support systems	☐	180

Your name: ______________________________ 181

Your job title: ______________________________ 182

Your area of responsibility: Corporate ☐ Business unit ☐ 183

If a business unit, which? ______________________________ 184

Finally, some questions about the questionnaire itself.

How do feel about the task of filling it in?

Very tedious ... Very interesting

-2	-1	0	+1	+2

185

What new insights into the issues of strategic IT decision making came to you while filling it in?

Very few .... Very many

-2	-1	0	+1	+2

186

How useful would it be to you as an <u>aide-memoire</u> in your own strategic thinking and decision making?

Very much .... Very little

-2	-1	0	+1	+2

187

Would you like a copy of the select bibliography of useful strategic IT planning literature?

Y	N

Thank you very much for participating. We hope you will find the research results useful, and that they will justify the time and effort you have given to the exercise.

APPENDIX C

GLOSSARY

This Glossary contains words and phrases which belong to other authors, or which are in general use, but are used in a special way in the Framework described in Chapter 4. Concepts and constructs defined in the Framework itself are not repeated here.

Alignment IT Strategy: A functional area strategy for the application of IT as a resource of the company, in support of a business strategy that has been laid down relatively independently of IT considerations.

Alignment IT strategy provides support for improving the organization as it now exists. It differs from impact IT strategy in regard to the amount of change the application of IT is allowed to introduce into the organizational design and/or organizational strategy set. The presumption is that the "organizational strategy set", i.e. company mission and objectives and the competitive strategy [King, 1978], and the fundamental organizational design will not change significantly.

In impact IT strategy, it is precisely understood that at least some elements of these will change significantly if the IT strategy is successful [cf. Benson & Parker, 1986: 71]. The point where an IT strategy ceases to be alignment and becomes impact is a matter of opinion. The term is borrowed from Benson and Parker [1985: 17] but is defined differently in this Study. See also "impact IT strategy".

Architecture: Organizational and technical blueprints to guide implementors of IT systems and infrastructure in progressing towards the target environment. Architecture provides the fundamental designs for structures (e.g. workstation, network, applications portfolio, business systems) and policies (directives, standards, protocols, criteria).

Business Units: Strategic sectors, strategic business units, divisions, etc., which focus on specific products and markets and are run as profit centres with management autonomy.

Business Unit Management: The head and other senior managers of a business unit, including managers of decentralized functions (e.g. decentralized research, engineering, systems departments).

Business Strategy: See "strategy".

Central Services: Corporate functions that are essentially central (e.g. secretary, comptroller, legal), and other functions the company decides to retain centrally (e.g. all or some of research, engineering, IT).

Competitive Strategy: According to Porter [1985: 1], competitive strategy aims to establish for the company a profitable and sustainable position against the forces that determine industry competition. Two central questions underlie the choice of competitive strategy: the attractiveness of industries for long-term profitability and the factors that determine it; the determinants of relative competitive position within an industry.

Conditions for Error: Properties of the internal planning environment that make errors uncorrectable [Argyris & Schön, 1978: 57-59]. These may be summarized as inadequacy (mistaken assumptions; incongruities; incompatibilities); obscurity/uncertainty (vagueness; ambiguity; excess/sparse detail; untestability); inaccessibility (scatter; withheld information; information important for action kept out of currency).

<u>Corporate</u>: Referring to the company as a whole; common to all business units in a company; company-wide.

<u>Corporate</u> <u>Management</u>: The chief executive officer (e.g. executive chairman, president, managing director), heads of business units (e.g. executive directors, general managers), heads of central services.

<u>Customization</u>: The "front end" of incremental IT strategy formulation; the selection of Components, Parts and Links of the Framework, their adaptation to the culture and requirements of a specific company, and their imbedding in the ordinary decision making processes of the company. Customizing the Framework results in the meta-architecture of the company's target environment. See also "instantiation".

<u>Dialectic</u>: A method of seeking knowledge by question and answer. Matters where the debate is logical rather than factual are suitable for treatment by the method. The method is not suitable where the object is to discover new facts - in empirical research, for example [Russell, 1961: 109-111]. In the Framework, the term is used instead of simply "enquiry" or "debate" to reflect "the dialectical nature of the larger process of organizational change within which we find episodes of learning or of failure to learn". [Argyris & Schön, 1978: 41] See also "organizational dialectic".

<u>Ends</u>: See "goals, objectives, ideals".

<u>Espoused</u> <u>Theory</u>: See "theory of action".

<u>Goals</u>, <u>Objectives</u>, <u>Ideals</u>: These terms follow Ackoff's [1981:63] usage. Goals are ends that can be attained within the

current operational planning period, which is usually one year and sometimes two years.

Objectives are ends that can be attained only after the current operational planning period, but towards which progress is possible within the tactical planning period, which is at least one year longer than the operational planning period.

Ideals are ends that are believed to be unattainable, or attainable only at some distant time, but towards which progress can be made during and after current operational and tactical planning periods.

<u>Impact</u> <u>IT</u> <u>Strategy</u>: A business strategy in which IT is applied to bring about certain desired changes in the organizational strategy set and/or organizational design. The term is borrowed from Benson & Parker [1985: 18] but is defined differently in this Framework. See also "alignment IT strategy".

<u>Information</u> <u>Technology</u> (<u>IT</u>): All the hardware, software, services, methods, tools, management processes and technical human skills involved in the use of information systems in business.

<u>Information</u> <u>Technology</u> <u>Support</u> <u>Organization</u> (<u>ITSO</u>): The generic organizational structures and functions and management responsibilities involved in planning, organizing, implementing and controlling information systems and services. All of these may be centralized in one department of the company, or they may be distributed in any of a number of ways - see, for example, the Buchanan & Linowes "distribution spectra" [Nolan, 1982: Chs. 3& 4]. The term comes from the B+OL+D Methodology [Online People, Seminar E-01], and is used in preference to traditional terms like "DP", "MIS" and "IS" to avoid preconceptions.

Instantiation: The "ongoing" stages of incremental IT strategy formulation. The substitution of specific environmental information, organization structures, IT structures and policies, information systems, etc., for the corresponding generic constructs of the meta-architecture. Over time, instantiation converts the meta-architecture into the macro-architecture of those elements of the target environment scheduled for implementation in the current medium term tactical plans.

The term is borrowed from the Prolog programming language and its underlying problem solving logic [Yin & Solomon, 1987: 40; Kowalski, 1979: 50], and indicates the process of "logical closure" in which generic concepts are bound to specific data [Mason, 1969: Footnote 18]. See also "customization".

Objectives: See "goals, objectives, ideals".

Organizational Development: The planned, organization-wide effort, managed from the top, to increase organizational effectiveness and health through planned interventions in the organization's processes, using behavioural science knowledge [Beckhard & Harris, 1977: 2-3].

This Framework proposes the "system-wide" version of OD as an appropriate framework within which, and a set of tools to apply to, managing the staged transition from the company's current IT planning environment to the target environment.

Organizational Dialectic: Formal decision making processes that address situations of organizational conflict and contradiction, including IT strategy problems that lie beyond the current limits of management experience in a company. It is accepted that whatever problem setting and problem solving techniques may be chosen, the solutions will lead inevitably to new situations of conflict and contradiction, and hence to new rounds of dialectic. [Argyris & Schön, 1978: 42]

Organizational IT Learning: In the Framework, organizational learning is understood as both an accumulation of experience and an active process. The experience refers to applying resources and managing environmental interactions to achieve the company's objectives. The process is that through which the conditions for development created by innovation are effectively managed to become "distinctive competences" of the organization [Hofer & Schendel, 1978: 25], and in which strategic decision makers themselves become more competent.

Organizational IT learning is a particular aspect of organizational learning. The experience refers to an understanding of the impacts of IT on the organizational strategy set and organizational design. The process involves detecting and correcting errors in formulating and implementing IT strategy, and removing the conditions for error.

> "When the error detected and corrected permits the organization to carry on its present policies or achieve its present objectives, then that error-detectionand-correction process is single-loop learning." [Argyris & Schön, 1978: 2-3]

> "Double-loop learning occurs when error is detected and corrected in ways that involve the modification of an organization's underlying norms, policies, and objectives." [Argyris & Schön, 1978: 3]

Second order learning occurs when the organization learns through the organizational dialectic to synthesize and manage larger classes of IT problem, and how to adapt the learning apparatus itself. [cf. Argyris & Schön, 1978: 26-27]

Planning Levels: Strategic, tactical and operational. Derives from Anthony's [1965] 3-level framework for planning and management control systems.

<u>Strategy</u>: In the Framework, this term refers to a hierarchy of related concepts, the principle sources of which are Bakopoulos & Treacy [1985], Hofer & Schendel [1978] , King [1978] and Porter [1980; 1985]. The business strategy of a company may be defined as the "fundamental pattern of present and planned resource deployments and environmental interactions that indicates how the organization will achieve its objectives" [Hofer & Schendel, 1978:25]. Its external elements are company mission, objectives and competitive strategy, which may be referred to as the organizational strategy set [King, 1978]. Its internal elements are organizational design and functional area management strategies, e.g. marketing management strategy, manufacturing strategy, personnel development strategy.

In addition to its business strategy, a company has an IT strategy, consisting of two parts - an IT technology strategy and an IT management strategy. The former refers to the application of IT to business purposes and uses, and the latter to the administrative, logistic and technical issues of implementing IT.

It is important to distinguish two kinds of IT strategy - alignment and impact. In alignment IT strategy, both the IT technology strategy and the IT management strategy are functional area strategies in support of pre-defined business ends. In impact IT strategy, the IT technology strategy is discussed as part of the business strategy. Both technology strategy and management strategy induce significant changes in the organizational strategy set and/or the organizational design.

<u>Theory of Action</u>: The core concept in Argyris & Schön's perspective of organizational learning, which is the perspective applied in this Framework.

> "... theories created to understand and predict may be quite different from theories created to help people make events come about. The latter, which we have called theories of action, must lead to understanding and prediction, but they must go beyond these two important functions." [Argyris & Schön, 1977: 5].

The gap between "espoused theories" - which people claim to be the guidelines of their actions - and "theories in use" - which actually guide their actions, and of which they may not even be aware - is a major difficulty in strategic IT decision making.

oooOooo

APPENDIX D

GENERIC ENVIRONMENTAL FACTORS

The following lists are not, and probably never could be, complete. They are intended only as a starting point for the analysis of environmental data described in the Decision Making Context Component (see Section 4.2 and Figure 7).

I. EXTERNAL ENVIRONMENT

A. The Business Domain

Generic factors that in the aggregate characterize the external operating environment of the company. For each factor, the questions that must be asked are:

> What are the specific opportunities and threats represented by this factor for this company, and how do they affect:
>
> > Goals: The current operational planning period?
> >
> > Objectives: The medium-term tactical planning period?
> >
> > Ideals: The long-term?
>
> In each time-frame, how can IT help the company exploit the opportunities and cope with the threats?

1. Global Factors

World-wide and national opportunities and inhibitors to the exploitation of IT in business strategy.

Political, social, economic and technological infra- structure of the country.

Political: The ideological, ethical and other norms of the country; stability, law and order; attitudes of foreign governments, suppliers and organizations; international co-operation organizations - economic, business and technological; international sanctions on the supply of technology.

Legal: General laws and regulations - national, regional, fiscal; specific regulations relating to machinery, personnel, intellectual property rights, acquisition and transmission of data; technology imports and exports; trans-border data flows.

Social: Education and training of IT professionals from all population groups; housing and other social constraints in IT recruitment; social impacts of IT applications.

Economic: International economic and business trends; national economic indicators, e.g. real growth, inflation, interest rates, per capita income, income distribution; macro factors, e.g. natural resources, availability of capital, foreign exchange, level of development, productivity, salaries and wages; organization and mobility of labour; information "economics", e.g. relative costs of hardware, software, human resources.

2. Industry Factors

The company's physical, human and financial resources relative to the rest of the industry.

The supplier and resource end of the company's operating environment.

The boundaries of the industry and of the company; the blurring of boundaries.

Potential sources of "upstream value" in applying IT to the company's competitive strategy [Porter, 1985: 34].

Physical Resources and Technologies: Kinds of resource and technology relevant to company, and trends in availability and development; micro-economics of company resources and technologies, e.g. production function, capital intensity, capacity; information intensity of products and processes; role - raw materials, sub-assemblies, services; rate of innovation in specific technologies.

Human Resources: The national skills pool - size, quality, growth and costs; cultural and attitudinal factors; social and political factors; bargaining power; organized labour.

Supply of Materials and Services: Geographical location; supply lines. supplier's industry - concentration, rate of growth, profit levels, relative level of supplier's profit margin, level of fixed or storage costs; supplier's product - standardization, differentiation, substitutes, price-performance trends, switching costs, relative importance to company (cost and use); company-supplier relationship - role of supplier e.g. producer, assembler, re-seller, distributor; role of the company, e.g. assembler, re-seller, distributor; relative importance of company's business to supplier (revenue, market share); scope for vertical integration - forward by the supplier, backward by the company; competitive information - available to the company about the supplier (markets, policies, costs, prices, turnover), and available to the supplier about the company.

3. Market Factors

The markets in which the company's products are distributed and purchased.

The buyer and competitor end of the company's operating environment.

The boundaries of the market and of the company; the blurring of the boundaries.

The potential source of "downstream value" in applying IT to the company's competitive strategy [Porter, 1985: 34].

<u>Market Structure</u>: Size, growth, share, concentration; geographic boundaries; inter-organizational and inter-market boundaries; basis and intensity of competition.

<u>Products and Services</u>: Characteristics of products; profitability, prices, quality, services offered; differentiability of product and service in consumer perception and use; rate of obsolescence, frequency of new products; potential substitutes; life cycle and "renewability" of the product.

<u>Buyers</u>: Geographical locations, dispersion, and isolation from other suppliers; cultural and attitudinal factors; social and political factors; role and bargaining power of the buyer - distributor, assembler, re-seller, end-user; buyer's industry - concentration, rate of growth, profit levels, relative level of buyer's profit margin, level of fixed or storage costs; company's product - standardization, differentiation, substitutes, price-performance trends, switching costs, relative importance to buyer (cost and use); company-buyer relationship - role of the company (producer, assembler,

re-seller, distributor); role of the buyer (assembler, re-seller, distributor); relative importance of buyer's business to company (revenue, market share); scope for vertical integration - forward by company, backward by buyer; competitive information - available to the company about the buyer (markets, policies, costs, prices, turnover), and available to the buyer about the company.

Competitors: Names, numbers, capacity, recent and expected changes; apparent market strategies; quality of service; competitor's IT positioning relative to the company's; competitor's rate of growth, relative level of profit margin, level of fixed or storage costs; structural barriers against new entrants - economies of scale, economies of scope, organizational slack, capital requirements; product barriers against new entrants - need to achieve low cost and, need to achieve high cost and complex differentiation, price-performance trends, switching costs; access to suppliers; access to distribution channels and buyers; relationships with existing competitors - number, diversity and balance of competitors; sources of rivalry; scope for co-operation or collusion; intelligence about competitors; exit barriers; gaining and protecting market share; competitive balance.

B. The IT Domain

Generic technologies and factors affecting the strategic exploitation of IT by the company.

For each technology and factor, the questions that must be asked are:

What are the specifics of this technology or factor as far as this company is concerned?

In what way, directly or indirectly, does this technology or factor impact specific opportunities and threats in this company's business domain?

It is possible to work in either or both of two directions when mapping business domain factors to IT domain factors: "outward" from business needs in search of IT solutions, or "inwards" from IT opportunities and threats to business objectives and ideals.

1. Generic Information Technologies

IT considered as a fundamental technology of the company.

The units of observation and analysis in IT environmental scanning.

Basic Technologies: Artificial intelligence, expert systems, robotics; computer-assisted design, manufacturing, education, training; databases - centralized and decentralized; data dictionaries; hardware - laser, fibre optics, printers, micro electronics, display screens, mainframe, mini computers, micro computers, intelligent work stations, dumb terminals, telecommunications, modems, multiplexors; media - cables, satellite, microwave, fiber optics; memory and storage - cache, solid-state, extended memory, content-addressable filestore, disks, tapes, cartridges, optical media, channels; micro-chip technology; office automation; software - operating systems, application software, integrated application software, compilers, languages, database management systems, data dictionary systems, data communication monitors, graphics; telecommunication networks - networking software and hardware, electronic mail, data access networks, satellite direct broadcasting, mobile cellular radio telephones, dial up, leased lines, Diginet, packet switching; viewdata, videotex, Beltel.

Levels of Integration [Otten, 1984]: First level -

technological systems, converging technologies, combinations of the basic technologies as integrated products, e.g. reprographics, robotics, voice/data/image processing systems; Second level - business systems - integration of first level systems into business systems and services and "turnkey" solutions; may be internal to the company (e.g. image storage and retrieval system for office support), or an inter-organizational system (e.g. SASWITCH).

Technological Alternatives: Performance, reliability and cost factors; range of applicability; relative merits of alternative solutions, e.g. viewdata vs. leased line vs. dial-up vs. value-added networks for distributor support; mainframes vs. minis vs. micros; competing architectures and "standards", e.g. IBM's SNA model vs. International Standards Organization's OSI model; centralized vs. decentralized vs. distributed control of data; competing proprietary approaches to office automation.

2. Potential Impacts of Specific Technologies

Organizational Design: On skills and abilities of workers; on the nature of factory and office processes; on job design and individual responsibilities; on organization structures; obtaining supplier commitment to the company's development path [Blauman, 1987]; contradictions in the company's IT architectures (e.g. secure operational data and systems vs. flexible user programming); limits to the feasibility of integration and open-ended architecture - cost, skills, lead time, risk; the risk of architectural "dis-integration" resulting from buy vs. make decisions; slow emergence of standards; multiple standards organizations; rate of development of specific technologies - need for realistic assumptions in corporate IT scenarios; changing microeconomics - e.g. IT can make small production runs become feasible and lead time to get market reduces.

Corporate and Inter-Organizational Networks: Changing the way information flows in and between organizations; linking geographic locations; linking sales and distribution functions directly with manufacturing and supply, under the control of central market planning, finance and accounting functions; effects on geographic and functional organizational structure of the corporation - the company can run as efficiently on a globally dispersed basis as on a locally concentrated basis; top management could be given real-time access to relevant, filtered information [cf. Ackoff,1967; Dearden, 1966; 1983]; world-wide information databases and product information; information affecting personal and political behaviour may be beyond the control of governments.

3. Information Technology Suppliers

Geographic location and political factors; vested interests of corporations that own the suppliers; risks of viability of the supplying company, or of its products; product prices, quality, state-of-the-art, obsolescence; delivery lead-times; maintenance and problem-resolution - "service levels"; quality of after-sales support; bargaining power - of supplier or of the buyer.

II. INTERNAL ENVIRONMENT

A. The Business Domain

Generic factors that in the aggregate characterize the internal IT planning environment of the company.

For each factor, the questions that must be asked are:

> What are the specific strengths and weaknesses represented by this factor in this company, and how do they affect goals, objectives and ideals?

In each time-frame, how can IT help the company capitalize on its strengths and eliminate or work around its weaknesses?

1. Company Culture

Philosophies and Values: Philosophies, values and norms of management that determine the kind and quality of the decisions they will make, and ultimately the organizational IT learning of which the company is capable; "theories of action" [Argyris & Schön, 1978], both "espoused" and "in use", that constitute behavioural constraints on IT decisions.

Planning View-points: Planning viewpoints that determine the kinds of IT strategy and decision making management is willing to contemplate, e.g. alignment vs. impact strategies, target environment vs. incremental planning, directive vs. participative decision making.

Attitudes, Beliefs and Styles: Management styles influencing the quality of the dialectic process; management and employee attitudes to alternative avenues of corporate and personal achievement; personal preferences of senior management and the attitudes and expectations of personnel that influence acceptance of the framework and of particular strategies, structures and changes in human work processes; focus of management attention and behaviour, e.g. operations, efficiency, effectiveness, opportunity, planning period, cost-consciousness, innovation; management attitudes to risk, e.g. entrepreneur, risk-averse; employee attitudes to the company and to IT.

Organizational Time-frame: The strategic planning horizon; the opportunity "windows" and IT lead times; how far ahead managers are willing to think, and thus what kind of IT infrastructure can be built.

2. Organization Strategy Set [King, 1978]

The key business and organizational factors of the company determining what management will come to see as the purposes and uses of IT in the company.

In conventional IT planning, these are the starting points of analysis. In the present Framework, they are factors that may or may not be confirmed in the dialectic.

<u>Mission</u>, <u>Ideals</u>, <u>Objectives</u>, <u>Goals</u>: The existing mission of the company - products, markets, technology, goals, objectives and ideals; the purpose of IT in the current concept of the business.

<u>Strategies</u> <u>and</u> <u>Business</u> <u>Plans</u>: Existing business strategies and business plans; current views of the uses of IT in support of the business; current action plans and the boundaries to what is achievable in the short term; business plans setting out the operating and financial objectives of the company; current criteria for determining the acceptability and priority of IT policies and projects, and how success of these will be measured.

3. Intrinsic Characteristics of the Company

<u>Size</u>: Size of the company in terms of assets, turnover, profit margins, personnel.

<u>Resources</u>: Availability of physical, human, technological and financial resources; knowledge and capability accumulated through experience; strengths for growth and diversification.

<u>External</u> <u>Control</u>: The company's stakeholders and the extent to which they must be considered in strategic decisions; the extent to which the company or business unit can make

its own decisions or is controlled by another organization; subsidiary and associated companies that must be taken into account in strategic decisions.

4. Organization and Management Structures

Formal Organization: Business units, processes and primary functions, and their relevance to human and information systems design; location of the firm infrastructure (including the information systems functions) as central services and/or business unit functions; pressures towards redistribution of these; roles in strategic IT decision making, and control of strategic IT human resources; management and professional reward and control systems; information and measurement systems.

Development and Learning: The company's understanding of business purpose as reflected in its "strategic business units" [Ohmae, 1983: 143-148] and "business unit inter-relationships" [Porter, 1985: 258-263]; organization needs for and limits to participative IT decision making; organizational and individual learning - inhibitors and synergies inherent in the organization structures and processes.

B. The IT Domain

Generic organizational and technological factors affecting the quality of strategic IT decisions and the assimilation of IT into the fabric of the company. For each factor, the questions that must be asked are:

What are the specifics of this factor in the internal environment of this company?

How does this factor affect specific strengths and weaknesses in this company's business domain?

As in the case of the External Environment (Section I.B. above), it is possible to work in either or both of two directions when mapping business factors to IT factors: "outward" from business strengths and weaknesses in search of IT support, or "inwards" from internal IT capabilities and limitations to feasible business plans.

1. Quality of the Information Systems Function

<u>Objective Factors</u>: The observed ability of the IT function to meet the strategic demands; the observed effectiveness of the internal structures of the information systems function(s), e.g. planning, design, development, operations; IT decision making processes and their effectiveness, e.g. steering committees, project management; the quality of operational systems and services, both real and perceived; the completeness of the current applications systems portfolio as currently perceived.

<u>Personal Factors</u>: Experience, skills, business orientation of IT managers and professionals; the general readiness of management for IT-supported and/or IT-induced change

2. Known Strategic IT Application Areas

Management intuitions regarding what can be done to enhance company products, processes and profitability benefit strategically through the use of IT.

<u>Strategic Purposes of IT</u>: Strategic targets for IT applications, e.g. customers, suppliers, competitors, allies; generic competitive strategies, e.g. massive cost-displacement, expansion of market coverage, product re-positioning; organizational effectiveness, e.g. real-time market information systems, management communications support, inter-organizational projects and

ventures, personal effectiveness systems.

Strategic Uses of IT: Automation of office processes; automation of factory processes; automation of controls; inter-organizational systems; professional support, e.g. CAD; automating the client interface; management information and/or decision support systems.

III. PRINCIPAL SOURCES

Ackoff [1981]; Anderson [1985]; Bates [1985]; Blauman [1987]; Bower [1982 (1), 1982(2)]; Bower [1982(1), 1982(2)]; Collins [1984]; Cymbala [1984]; Daniel [1961]; EDP Analyzer [September, 1984]; Ghymn & King [1976]; Koutsoyiannis [1979]; Leidecker & Bruno [1984]; McKenney & McFarlan [1982, 1983]; Otten [1984]; Parsons [1983]; Porter [1980]; Wiseman [1985].

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APPENDIX E

INSTANTIATING THE STRATEGIC OPTION GENERATOR

The following lists are not, and probably never could be, complete. They are intended only as a starting point for building the company's own strategic option generator (first two steps only), as described in the Decision Content Component (see Section 4.3 and Figure 11).

I. SUPPLIER

Supplier's industry - concentration, rate of growth, profit levels, relative level of supplier's profit margin, level of fixed or storage costs.

Supplier's product - standardization, differentiation, substitutes, price-performance trends, switching costs, relative importance to company (cost and use).

Company-supplier relationship - role of supplier (producer, assembler, re-seller, distributor), role of company (assembler, re-seller, distributor), relative importance of company's business to supplier (revenue, market share).

Scope for vertical integration - forward by supplier, backward by company.

Competitive information - available to the company about the supplier (markets, policies, costs, prices, turnover), to the supplier about the company.

II. CUSTOMER

Buyer's industry - concentration, rate of growth, profit levels, relative level of supplier's profit margin, level of fixed or storage costs.

Company's product - standardization, differentiation, substitutes, price-performance trends, switching costs, relative importance to customer (cost and use).

Company-customer relationship - role of company (producer, assembler, re-seller, distributor), role of customer (assembler, re-seller, distributor), relative importance of customer's business to company (revenue, market share).

Scope for vertical integration - forward by company, backward by customer.

Competitive information - available to the company about the customer (markets, policies, costs, prices, turnover), to the customer about the company.

III. COMPETITOR

Company's industry - concentration, rate of growth, profit levels, relative level of supplier's profit margin, level of fixed or storage costs.

Barriers against new entrants - structural (economies of scale, economies of scope, organizational slack, capital requirements), product (low-cost standardization, high-cost and complex differentiation, price-performance trends, switching costs), access to suppliers, access to distribution channels and customers.

Relationships with existing competitors - number, diversity and balance of competitors, sources of rivalry, scope for co-operation or collusion, intelligence about competitors, exit barriers.

IV. DIFFERENTIATION - "The Marketing Mix"

Product - quality, features, options, accessories, installation, instructions, service, style, brand name, packaging, sizes, warranties, product lines, returns.

Price - flexibility, level, discounts, allowances, payment period, credit terms, geographic terms.

Place - channels, market coverage, locations, inventory, transport, kinds of middlemen, service levels.

Promotion - advertising, personal selling, sales promotion, publicity, kinds of salespeople.

V. COST

Economies of scale.

Production economies - automation, specialization, saving time, reducing inventory levels, altering the capital/labour factor intensity ratio, changing short-term and long-term cost curves, lowering break-even points, learning curve effects.

Marketing economies - advertising, large-scale promotion, exclusive dealers with service department obligations.

Managerial economies - specialization and teamwork experience, centralization/decentralization, managerial tools and techniques for large-scale or for replicated small-scale operations.

Transport and storage economies - "failures of proportionality" (e.g. relatively fewer technicians needed as number of machines increases, higher loading factors as scale of plant increases).

Pecuniary economies - lower prices for bulk buying, lower cost of finance, lower transport rates.

Economies of scope - by-products, combined products, higher loading of fixed factors, re-use of resources, transferable skills and knowledge, flexible manufacturing.

Information economies - data on social, political and economic trends, intelligence on policies, costs, prices, sales, etc. of the strategic targets.

Reduction of organizational slack - permitting the company to work closer to its "production frontier" by reducing or eliminating unnecessarily low prices, excess wages and executive compensation, growth of sub-units and services without concern for the relation between additional payments and additional revenue.

VI. INNOVATION

Product - changes in existing products, new products.

Processes - new ways of resourcing, making, delivering and servicing the product, new ways of doing business.

New understanding of the components of company mission.

VII. GROWTH

Organic expansion - existing plant and locations, additional plant, new locations.

Functional - vertical integration, forward or backward.

Product diversification - enhancing existing products, extending the product line, new product lines.

Market diversification - increase existing share, enter new segments, new geographical locations, IS "spinoffs" to market the company's own systems, techniques and skills.

VIII. ALLIANCE

Forms of alliance - co-operative agreements, joint ventures, equity-linked groups, mergers and acquisitions.

Reasons for alliance - gain access to resources or deny competitor access, lower own or raise competitor's costs, increase own or decrease competitor's differentiation, develop or imitate innovative products and processes, expand range of customer groups and needs satisfied, technologies used and functions controlled.

Kinds of alliance - product, product distribution, product development, service, R&D, product support.

IX. PRINCIPAL SOURCES

Koutsoyiannis [1979: 127]; McCarthy [1978: 41]; Porter [1985: Chs. 3 & 4]; Sawyer [1979: 130-132]; Wiseman [1985: Chs. 3-7].

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APPENDIX F

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APPENDIX G

TABLES

TABLE 1

Number of Returns by CUC Class

Notes: (1) Total number of companies responding is equal to the number of Type C responses, i.e. 28.
(2) See Appendix A for explanation of Membership Class and Respondent Type.
(3) Membership Class A includes one very large member with 200 000 employees.

CUC Members		Usable Responses								
		Respondent Type					All Employees		IT Employees	
Class	Number Polled	A	B	C	Tot	Resp. Rate %	Total	%	Total	%
A	44	19	19	22	60	50	411050	94	5232	95
B	26	3	3	6	12	23	24200	6	295	5
C	10	0	0	0	0	0	0	0	0	0
	80	22	22	28	72	35	435250	100	5527	100

TABLE 2

Number of Returns by Industry

Notes: (1) Total number of companies responding is equal to the number of Type C responses, i.e. 28.
(2) See Appendix A for explanation of Membership Class and Business Sector.

CUC Members		Usable Responses								
		Membership Class					All Employees		IT Employees	
Business Sector	Number Polled	A	B	C	Tot	Resp. Rate %	Total	%	Total	%
Finance	25	11	2	0	13	52	92250	21	3405	62
Industry	31	2	4	0	6	19	80500	18	661	12
Oil	5	4	0	0	4	80	12000	3	358	6
Retail	7	4	0	0	4	57	50500	12	623	11
Transport	4	1	0	0	1	25	200000	46	480	9
Mining	7	0	0	0	0	0	0	0	0	0
Bureau	1	0	0	0	0	0	0	0	0	0
	80	22	6	0	28	35	435250	100	5527	100

TABLE 3

Number of Returns by Organization Structure

Notes: (1) Total number of companies responding is equal to the number of Type C responses, i.e. 28.
(2) IT Organization:
A = Single unit
B = Centralized operations, decentralized development
C = Decentralized operations, centralized development
D = Other.

	Company Organization									
	Single Business Unit					Multiple Business Units				
	IT Organization					IT Organization				
Business Sector	A	B	C	D	Tot	A	B	C	D	Tot
Finance	3	0	0	0	3	7	1	2	0	10
Industry	1	0	0	0	1	4	0	1	0	5
Oil	0	0	0	0	0	2	0	2	0	4
Retail	0	0	0	0	0	2	1	0	1	4
Transport	0	0	0	0	0	0	0	1	0	1
	4	0	0	0	4	15	2	6	1	24

TABLE 4

Employee Ratios by Size of Company

Note: Employee ranges were chosen to isolate the two "outriders", one at the low end and the other at the high end.

		Total Employees per IT Employee			Development Employees per Operations Employee		
Total Employees	Number of Companies	Min.	Avg.	Max.	Min.	Avg.	Max.
Less than 1000	1	2	2	2	0.4	0.4	0.4
1000 to 2500	6	13	23	50	0.4	1.4	3.4
2501 to 5000	8	15	34	118	0.3	0.9	1.4
5001 to 10000	4	36	69	250	0.3	0.9	1.5
10001 to 100000	8	18	53	149	0.5	1.0	2.0
Over 100000	1	417	417	417	0.9	0.9	0.9
Overall	28	2	79	417	0.3	0.9	3.4

TABLE 5

Employee Ratios by Industry

Note: The two "outriders" referred to in Table 4 are excluded from Table 5.

Business Sector	Number of Companies	Total Employees Per IT Employee			Development Employees Per Operations Employee		
		Min	Avg	Max	Min	Avg	Max
Finance	12	15	29	50	0.3	0.9	3.4
Industry	6	21	122	250	0.3	0.9	2.2
Oil	4	13	34	66	0.9	1.4	2.2
Retail	4	48	81	149	0.5	1.0	1.8
Overall	26	13	48	250	0.3	1.0	3.4

TABLE 6

Perceptions of the Internal Planning Environment

Notes: (1) 21 usable pairs of Types B and C responses
(2) Dfs = the number of companies in which the B and C responses to the question were different.

		Number of Yes Responses				
		Business		IT		
Qn	Attribute	No.	%	No.	%	Dfs
12	Formal corporate planning exists	18	86	17	81	5
13	IT decision making process exists	20	95	16	76	4
14	Corporate and IT planning interact	19	90	16	76	7
15	IT costs cycle exceeds 1 year	15	71	15	71	4
16	IT strategic benefit is measured	13	62	12	57	9
17	IT expenses grow faster than sales	17	81	10	48	7
18	Development costs are charged back	16	76	15	71	7
19	Operations costs are charged back	14	67	15	71	7
20	Project costs/benefits are evaluated	17	81	17	81	2
21	A documented IT strategy exists	19	90	18	86	1
22	Senior IT steering committee exists	20	95	19	90	3
23	IT liaison posts exist	15	71	14	67	9
24	IT R&D/technology posts exist	13	62	10	48	7
25	Business analysts/IT O&M posts exist	15	71	14	67	5
26	Hands-on user programmers exist	16	76	17	81	3
27	PCs are being or will be used widely	17	81	21	100	4

TABLE 7

Perceptions of Strategic Issues Management

Notes:
(1) Usable responses: A = 21; B = 19; C = 26.
(2) Rating = the percentage of useable responses in which the item was rated more than 5.
(3) How Managed = the percentage distribution of the scores given to items rated over 5.

Qn	Strategic Issue	Rsp	Rating % > 5	How Managed Poorly -2	-1	0	+1	Well +2
28	Disaster and Security Plans	A	81	0	12	24	47	17
		B	79	0	7	53	33	7
		C	100	0	27	19	31	23
29	Co-operating with CUC, CSSA	A	57	8	0	42	50	0
		B	47	11	11	11	56	11
		C	58	7	20	40	13	20
30	Co-operating with SAPO	A	43	0	11	33	44	12
		B	21	0	0	75	25	0
		C	38	0	0	50	30	20
31	Vendor Relations and Supply	A	90	0	0	21	58	21
		B	74	0	0	14	57	29
		C	88	0	4	27	52	17
32	Using IT in Business Strategy	A	71	0	7	27	47	19
		B	95	0	28	22	44	6
		C	85	0	23	27	36	14
33	Measuring the IT Contribution	A	62	0	38	8	38	16
		B	89	12	41	41	6	0
		C	85	14	27	23	31	5
34	Office/Factory Automation	A	71	7	13	40	33	7
		B	74	0	21	51	21	7
		C	65	0	12	47	41	0
35	Better MIS/Decision Support	A	95	5	15	35	40	5
		B	95	0	17	39	38	6
		C	92	0	13	21	62	4
36	Inter-Organizational Systems	A	33	0	0	29	57	14
		B	47	0	33	45	22	0
		C	42	0	18	46	27	9

TABLE 7 Cont.

Perceptions of Strategic Issues Management

Qn	Strategic Issue	Rsp	Rating % > 5	How Managed: Poorly -2	-1	0	+1	Well +2
37	Exploiting New Technologies	A	48	10	20	50	20	0
		B	53	20	20	30	30	0
		C	65	6	24	58	12	0
38	Developing IT Infrastructure	A	43	11	11	56	22	0
		B	53	0	20	30	40	10
		C	69	17	22	44	17	0
39	Shorter Application Lead Time	A	86	0	28	39	28	5
		B	84	6	38	43	13	0
		C	88	0	35	26	39	0
40	Improving Operational Quality	A	100	0	14	24	43	19
		B	95	0	17	22	50	11
		C	96	0	28	32	24	16
41	Software Development Tools	A	81	0	12	35	53	0
		B	84	13	0	50	37	0
		C	88	9	17	30	35	9
42	Organization Adapted to IT	A	90	0	37	32	26	5
		B	63	0	17	66	17	0
		C	69	6	27	50	17	0
43	Reducing Paper Handling	A	71	20	20	27	33	0
		B	47	11	22	45	22	0
		C	77	0	20	55	25	0
44	Managing Data as a Resource	A	86	0	28	39	17	16
		B	74	0	14	57	29	0
		C	85	5	23	18	45	9
45	Applications as a Portfolio	A	76	6	19	25	38	12
		B	63	0	0	50	33	17
		C	81	0	24	29	37	10
46	Promoting End-User Computing	A	81	0	18	29	29	24
		B	84	0	19	19	49	13
		C	69	0	6	28	55	11
47	Buy Rather Than Make Software	A	43	0	0	67	33	0
		B	42	0	37	37	13	13
		C	38	10	10	10	60	10

TABLE 7 Cont.

Perceptions of Strategic Issues Management

Qn	Strategic Issue	Rsp	Rating % > 5	How Managed: Poorly -2	-1	0	+1	Well +2
48	Managing IT Human Resources	A	86	6	28	11	50	5
		B	100	5	32	32	26	5
		C	96	0	16	28	40	16
49	Project Cost/Benefit/Risk	A	90	0	53	21	11	15
		B	95	6	43	28	17	6
		C	88	4	26	35	26	9
50	Measuring IT Effectiveness	A	86	6	39	28	22	5
		B	95	0	11	39	39	11
		C	81	10	33	33	14	10
51	Include IT in Business Plans	A	81	0	35	24	24	17
		B	74	7	21	21	51	0
		C	85	14	27	36	18	5
52	IT Organization and Roles	A	86	0	22	39	28	11
		B	63	0	17	33	42	8
		C	77	5	10	40	25	20
53	Controlling Overall IT Costs	A	90	5	32	37	11	15
		B	79	0	13	47	27	13
		C	92	4	0	33	50	13
54	Learning to Plan IT Strategy	A	81	6	18	24	52	0
		B	74	0	14	50	36	0
		C	81	0	14	52	29	5
55	Learning to Assimilate IT	A	71	7	13	27	47	6
		B	74	7	0	64	29	0
		C	77	5	15	45	30	5
56	Better Business/IT Dialogue	A	90	0	26	26	47	1
		B	89	6	18	58	18	0
		C	88	0	13	44	30	13
57	Building IT Management Skills	A	81	0	24	53	18	5
		B	89	6	24	52	18	0
		C	85	0	14	54	27	5

TABLE 8

Ranking of the Strategic Issues by Importance

Notes: (1) Table 8 is based on the same data as Table 7.
(2) Highest rank is 1, lowest is 30.
(3) In each column, issues are ranked according to the average of the ratings (1 to 10) given by that group.

		Financial Companies			Other Companies		
		Respondents			Respondents		
Qn	Strategic Issue	A	B	C	A	B	C
28	Disaster and Security Plans	2	25	3	12	6	1
29	Co-operating with CUC, CSSA	8	22	25	27	28	27
30	Co-operating with SAPO	29	30	30	29	30	28
31	Vendor Relations and Supply	3	26	4	9	9	10
32	Using IT in Business Strategy	13	3	10	21	2	7
33	Measuring the IT Contribution	28	9	16	24	17	12
34	Office/Factory Automation	24	8	28	22	18	23
35	Better MIS/Decision Support	5	7	8	3	3	4
36	Inter-Organizational Systems	26	28	24	30	29	29
37	Exploiting New Technologies	27	24	26	26	27	25
38	Developing IT Infrastructure	25	21	21	28	26	26
39	Shorter Application Lead Time	4	5	5	16	13	17
40	Improving Operational Quality	1	2	2	5	4	11
41	Software Development Tools	19	15	7	17	15	13
42	Organization Adapted to IT	16	17	27	14	19	21
43	Reducing Paper Handling	12	11	18	23	25	22
44	Managing Data as a Resource	9	10	11	4	16	3
45	Applications as a Portfolio	23	13	20	11	22	6
46	Promoting End-user Computing	17	20	23	7	8	18
47	Buy Rather Than Make Software	30	29	29	25	24	30
48	Managing IT Human Resources	10	1	1	2	1	2
49	Project Cost/Benefit/Risk	7	4	9	15	5	9
50	Measuring IT Effectiveness	15	6	13	8	11	24
51	Include IT in Business Plans	18	12	12	6	20	14
52	IT Organization and Roles	14	27	19	13	23	19
53	Controlling Overall IT Costs	6	16	15	18	10	8
54	Learning to Plan IT Strategy	22	19	17	20	14	15
55	Learning to Assimilate IT	20	23	22	19	21	20
56	Better Business/IT Dialogue	11	18	6	1	7	5
57	Building IT Management Skills	21	14	14	10	12	16

TABLE 9

Comparison of American and South African Rankings

Notes: (1) Source of American rankings: Brancheau & Wetherbe [1987]
(2) NR = no comparable American ranking.
(3) Relative questions = the Questions of the present Study that appear to correspond most closely to the "Key Issue" of the American survey.

Key Issue	Relative Questions	American IS	American GM	Highest S.A. Ranks IT	Highest S.A. Ranks Business
Strategic Planning	54	1	1	14	10
Competitive Advantage	32, 36	2	2	7	2
Organizational Learning	42, 55, 56	3	3	5	1
IS's Role & Contribution	33, 51	4	5	12	6
IS Place in Organization	52, 57	5	7	14	10
End-User Computing	46	6	6	18	7
Data as Corporate Resource	44	7	8	3	4
Information Architecture	38	8	9	21	21
Measuring Effectiveness	49, 50	9	4	9	4
Integrating DP,OA,FA,TC	38	10	10	21	21
Telecommunications	30, 36	11	11	24	26
Human Resources	48	12	13	1	1
Software Development	39, 41	13	12	5	4
Multi-vendor Integration	31, 38	14	16	4	3
Artificial Intelligence	37	15	NR	25	24
Applications Portfolio	45	16	15	6	11
Factory Automation	34, 43	17	14	18	8
Security and Control	28	18	NR	1	2
Packaged Software	47	19	NR	29	24
IS's Funding Level	53	20	NR	8	6
Cooperating with CUC, CSSA	29	NR	NR	25	8
MIS/Decision Support	35	NR	NR	4	3
Operational Quality	40	NR	NR	2	1

TABLE 10

Perceived Importance of IT Decision Making

Notes: Number of usable responses: A = 22; B = 21; C = 28.

Qn	Issue	Rsp	Disagree -2	-1	0	+1	Agree +2
62	Survival depends on existing systems	A:	0	5	5	23	67
		B:	5	0	0	52	43
		C:	4	7	4	39	46
63	Survival depends on new systems	A:	0	0	14	27	59
		B:	0	0	0	43	57
		C:	4	4	11	39	42
64	Operational planning is critical	A:	0	5	5	36	54
		B:	0	0	19	33	48
		C:	0	11	11	39	39
65	IT strategy must be long-term	A:	0	0	0	36	64
		B:	0	0	5	29	66
		C:	0	11	0	21	68
66	Good business/IT dialogue is critical	A:	0	0	0	32	68
		B:	0	0	14	29	57
		C:	0	0	4	29	67
67	IT does not constrain company goals	A:	27	23	23	27	0
		B:	10	29	14	43	4
		C:	18	36	4	39	3
68	IT can alter company objectives	A:	23	36	27	14	0
		B:	10	38	29	14	9
		C:	11	39	4	36	10
69	Strategic IT decisions must be formal	A:	0	0	9	32	59
		B:	0	5	19	43	33
		C:	0	7	4	50	39
70	Build infrastructure before systems	A:	0	0	9	36	55
		B:	0	0	14	38	48
		C:	0	4	7	54	35
71	Base strategy on a target environment	A:	0	18	23	36	23
		B:	5	14	19	49	13
		C:	0	25	21	32	22

TABLE 10 Cont.

Perceived Importance of IT Decision Making

Qn	Issue	Rsp	Disagree -2	-1	0	+1	Agree +2
72	Implement IT strategy incrementally	A:	18	59	5	14	4
		B:	10	52	0	33	5
		C:	14	68	7	11	0
73	Involve many people in IT decisions	A:	14	55	5	18	8
		B:	19	48	10	19	4
		C:	25	39	18	14	4
74	Base IT strategy on business strategy	A:	0	9	0	32	59
		B:	0	0	0	43	57
		C:	0	0	4	32	64
75	Exploit any feasible IT opportunity	A:	27	41	9	18	5
		B:	38	33	10	14	5
		C:	43	46	4	7	0

(Percentage Responses)

TABLE 11

Perceived Quality of IT Decision Making

Notes: Number of usable responses: A = 22; B = 21; C = 28.

Qn	Issue	Rsp	Disagree -2	-1	0	+1	Agree +2
			Percentage Distribution				
76	Little done about environment risks	A:	18	45	18	18	1
		B:	10	48	24	14	5
		C:	39	54	0	7	0
77	No business direction to IT planning	A:	14	41	9	27	9
		B:	10	57	0	33	0
		C:	14	43	11	25	7
78	IT managers' poor grasp of business	A:	23	40	14	23	0
		B:	14	67	0	14	5
		C:	36	43	7	14	0
79	Operational systems meet objectives	A:	0	14	23	50	13
		B:	14	24	10	52	0
		C:	4	21	21	43	11
80	All needed systems are in place	A:	18	54	5	23	0
		B:	24	61	10	5	0
		C:	14	57	7	18	4
81	Systems match the jobs they support	A:	0	18	32	45	5
		B:	10	19	10	62	0
		C:	4	29	18	46	4
82	The IT team is stable	A:	5	18	27	45	5
		B:	10	19	19	52	0
		C:	0	11	14	61	14
83	The IT managers are competent	A:	0	0	32	64	4
		B:	5	5	19	57	14
		C:	0	0	11	64	25
84	IT technical staff are competent	A:	0	14	23	59	4
		B:	0	14	29	57	0
		C:	0	4	11	50	36
85	Few systems failures in recent years	A:	5	0	23	55	17
		B:	0	19	10	57	14
		C:	4	14	4	57	21

TABLE 11 Cont.

Perceived Quality of IT Decision Making

Qn	Issue	Rsp	Disagree -2	-1	0	+1	Agree +2
86	Few non-IT people understand IT	A:	0	23	5	59	13
		B:	0	14	14	43	29
		C:	0	32	0	50	18
87	The company's IT lags the industry	A:	14	36	23	23	4
		B:	14	67	0	14	5
		C:	25	46	11	11	7
88	Don't have the skills for IOS	A:	23	63	9	5	0
		B:	10	57	10	19	5
		C:	21	61	11	7	0
89	Satisfactory investment in IT R&D	A:	5	36	27	23	9
		B:	5	24	29	38	5
		C:	11	43	7	36	4
90	IT contribution effectively measured	A:	14	40	23	23	0
		B:	0	62	24	14	0
		C:	14	57	18	11	0
91	IT effectiveness is measured	A:	9	45	23	23	0
		B:	5	43	10	43	0
		C:	18	47	14	21	0

TABLE 12

Perceived Decentralization of IT Decision Making

Notes: (1) Number of usable responses: B = 21; C = 28.
(2) VC = Very centralized
C = Somewhat centralized
B = Balanced
D = Somewhat decentralized
VD = Very decentralized.

Qn	Issue	Rsp	Centr. VC	Centr. C	B	Decentr. D	Decentr. VD
92	Selecting mainframes	B:	81	5	5	10	0
		C:	89	7	4	0	0
93	Selecting terminals and PCs	B:	57	14	24	5	0
		C:	54	32	14	0	0
94	Planning the data comms network	B:	43	38	10	5	5
		C:	75	14	7	0	4
95	Selecting mainframe software	B:	76	10	5	5	5
		C:	86	11	4	0	0
96	Selecting application packages	B:	33	14	38	10	5
		C:	46	18	32	4	0
97	Planning the database	B:	52	33	0	10	5
		C:	75	18	4	4	0
98	Selecting application systems	B:	38	33	24	0	5
		C:	32	36	29	0	4
99	Planning application systems	B:	29	24	29	14	5
		C:	36	36	25	0	4
100	Deciding operational schedules	B:	52	19	10	14	5
		C:	36	32	29	0	4
101	Establishing access controls	B:	52	29	10	10	0
		C:	64	29	7	0	0
102	Adapting office systems to IT	B:	29	19	43	5	5
		C:	14	39	29	14	4
103	Deciding mainframe capacity	B:	76	10	5	5	5
		C:	82	11	4	4	0

TABLE 12 Cont.

Perceived Decentralization of IT Decision Making

Qn	Issue	Rsp	Central. VC	Central. C	Decentral. B	Decentral. D	Decentral. VD
104	Deciding overall IT cost level	B:	43	38	14	5	0
		C:	46	25	29	0	0
105	Forecasting capacity needs	B:	24	38	29	5	5
		C:	54	11	25	7	4
106	Technology and vendors	B:	52	43	0	5	0
		C:	68	21	11	0	0
107	Formulating overall IT strategy	B:	38	24	29	10	0
		C:	50	21	25	4	0

Percentage Responses

TABLE 13

Awareness of Decision Making tools and Techniques

Notes: (1) Usable responses: A = 23; B = 21; C = 28
(2) ? = Never heard of it
H = Heard of it, but never used it
T = Tried it, but did not find it useful
U = Found it moderately useful
VU = Found it very useful.

Qn Tool or Technique	Rsp	?	H	T	U	VU
		Percentage Responses				
108 Brainstorming	A:	0	18	0	36	46
	B:	0	0	5	43	52
	C:	0	4	4	46	46
109 Business strategy model	A:	23	41	0	14	22
	B:	24	14	0	48	14
	C:	11	36	4	39	11
110 Business Systems Planning (BSP)	A:	50	36	5	0	9
	B:	19	14	14	38	14
	C:	7	43	18	25	7
111 Cost/benefit evaluation model	A:	14	45	0	18	23
	B:	19	19	5	38	19
	C:	7	14	11	57	11
112 Critical Success Factors Technique	A:	50	32	0	9	9
	B:	33	33	0	0	33
	C:	11	29	0	32	29
113 Environmental scanning	A:	32	32	5	14	17
	B:	33	14	0	38	14
	C:	39	18	0	29	14
114 Feasibility studies	A:	0	14	5	18	63
	B:	5	5	0	48	43
	C:	0	0	7	46	46
115 Financial modelling	A:	5	27	0	36	32
	B:	5	19	5	43	29
	C:	0	18	4	43	36
116 Nolan Stages Theory	A:	77	14	0	5	4
	B:	67	14	0	19	0
	C:	14	18	11	39	18

TABLE 13 Cont.

Awareness of Decision Making tools and Techniques

Qn	Tool or Technique	Rsp	?	H	T	U	VU
			Percentage Responses				
117	Nominal Group Technique	A:	73	14	0	9	4
		B:	62	33	0	5	0
		C:	75	11	0	7	7
118	PERT, Critical Path, etc.	A:	5	23	5	36	31
		B:	14	5	10	62	10
		C:	0	11	14	36	39
119	Porter "strategic forces"	A:	81	9	5	5	0
		B:	48	33	5	10	5
		C:	43	29	4	18	7
120	Porter "value chain" analysis	A:	81	19	0	0	0
		B:	52	29	5	10	5
		C:	39	32	11	11	7
121	Project management systems	A:	18	27	0	5	50
		B:	19	14	33	33	0
		C:	0	11	4	39	46
122	Service level agreements	A:	27	18	9	23	23
		B:	14	29	10	33	14
		C:	7	18	4	29	43
123	Strategy set transformation	A:	100	0	0	0	0
		B:	90	5	0	0	5
		C:	86	11	0	4	0
124	Tetrarch	A:	68	5	5	5	17
		B:	38	19	24	10	10
		C:	4	57	11	14	14
125	Alloway User Needs Survey	A:	64	14	9	5	8
		B:	38	19	24	5	14
		C:	21	50	14	7	7
127	Application portfolio	A:	82	9	5	0	4
		B:	71	19	0	10	0
		C:	25	50	0	18	7

TABLE 13 Cont.

Awareness of Decision Making tools and Techniques

Qn	Tool or Technique	Rsp	?	H	T	U	VU
			Percentage Responses				
128	BIAIT	A:	100	0	0	0	0
		B:	95	5	0	0	0
		C:	93	7	0	0	0
129	B+OL+D	A:	95	5	0	0	0
		B:	86	10	0	0	5
		C:	82	14	0	4	0
130	BICS	A:	91	9	0	0	0
		B:	81	19	0	0	0
		C:	82	18	0	0	0
132	Change management processes	A:	59	18	0	9	14
		B:	48	19	10	14	10
		C:	14	18	0	25	43
133	Customer Resource Life Cycle	A:	91	9	0	0	0
		B:	86	10	5	0	0
		C:	82	11	0	4	4
134	Hansen Enterprise Survey	A:	100	0	0	0	0
		B:	90	10	0	0	0
		C:	82	18	0	0	0
135	EwIM	A:	95	5	0	0	0
		B:	90	5	0	5	0
		C:	68	25	0	4	4
136	EP/DP	A:	90	5	0	5	0
		B:	76	14	0	10	0
		C:	71	21	0	4	4
137	Innovation management techniques	A:	86	9	0	0	5
		B:	81	10	5	0	5
		C:	82	11	0	7	0
138	McFarlan's Grid	A:	77	14	0	5	4
		B:	47	38	5	10	0
		C:	21	32	4	29	14
139	ISMOD	A:	100	0	0	0	0
		B:	81	19	0	0	0
		C:	82	18	0	0	0

TABLE 13 Cont.

Awareness of Decision Making tools and Techniques

Qn	Tool or Technique	Rsp	?	H	T	U	VU
			Percentage Responses				
140	Org. Information Reqmts. Analysis	A:	95	0	0	0	5
		B:	86	14	0	0	0
		C:	100	0	0	0	0
141	Portfolio risk analysis	A:	73	18	0	9	0
		B:	52	38	0	10	0
		C:	21	43	4	25	7
142	Priority setting methods	A:	32	14	0	23	31
		B:	38	24	5	14	19
		C:	25	7	4	43	21

TABLE 14

Perceived Success of IT Decision Making

Note: Usable responses: A = 22; B = 21; C = 28.

Successful Outcome	Rsp	Very Poor -2	-1	0	Very Good +1	+2
143 Lower costs	A:	5	27	23	23	22
	B:	0	33	38	19	10
	C:	0	4	32	46	18
144 Higher turnover/profit	A:	0	18	27	50	5
	B:	0	19	48	33	0
	C:	0	18	36	29	17
145 Greater product quality	A:	0	14	23	45	18
	B:	0	10	38	52	0
	C:	0	4	25	54	17
146 Good high tech image	A:	5	18	23	41	13
	B:	0	10	33	52	5
	C:	0	14	18	57	11
147 Goals attained - market share	A:	5	18	36	36	5
	B:	5	19	38	33	5
	C:	5	18	39	21	17
148 Goals attained - company growth	A:	0	23	32	41	4
	B:	5	10	62	19	4
	C:	0	18	57	18	7
149 Goals attained - return on capital	A:	0	18	50	27	5
	B:	10	5	62	19	4
	C:	0	18	46	29	7
150 Co-ordination/consensus	A:	5	23	50	22	0
	B:	5	24	52	19	0
	C:	4	32	32	29	3
151 High quality dialogue - strategic	A:	0	32	27	36	5
	B:	0	24	43	29	4
	C:	4	39	32	25	0
152 Issues clarified	A:	5	27	41	23	4
	B:	0	24	57	14	5
	C:	0	29	32	39	0

TABLE 14 Cont.

Perceived Success of IT Decision Making

Successful Outcome	Rsp	Very Poor -2	-1	0	Very Good +1	+2
153 Quick response to needs	A:	0	59	23	18	0
	B:	5	43	42	10	0
	C:	4	32	21	43	0
154 High quality dialogue - operational	A:	9	27	44	18	2
	B:	0	52	38	10	0
	C:	4	29	43	21	3

TABLE 15

Perceived Strategic Purposes of IT

Notes:

(1) Usable responses:

Finance	A = 9; B = 9; C = 12
Industry	A = 4; B = 4; C = 6
Oil	A = 3; B = 3; C = 4
Retail	A = 4; B = 3; C = 4
Transport	A = 0; B = 1; C = 1

(2) avg = average of all ratings (1 to 10)

max = maximum of all ratings (1 to 10)

rnk = rank according to average ratings.

TABLE 15 Cont.

Perceived Strategic Purposes of IT

		Finance									Oil								
		A			B			C			A			B			C		
Qn	Purpose	avg	max	rnk	avg	max	rnk	avg	max	rnk	avg	max	rnk	avg	max	rnk	avg	max	rnk
155	Add value to our product	7.2	10	2	6.9	9	3	7.9	10	1	6.3	9	5	6.3	8	5	6.5	10	3
156	Tie customers to us	6.9	10	3	7.1	10	2	7.5	10	2	4.7	6	9	7.3	8	3	6.0	8	5
157	Become low-cost leader	5.6	10	6	7.8	10	1	7.3	10	3	6.7	8	4	9.0	10	2	4.8	8	6
158	Integrate forward	3.4	8	12	5.7	9	8	5.5	10	9	5.0	8	8	4.0	10	11	3.8	7	7
159	Suppliers compete for us	2.4	6	15	5.6	9	9	4.8	10	12	4.3	7	14	2.7	5	14	1.8	5	13
160	Suppliers conform to us	1.8	6	17	5.8	9	7	4.6	8	14	4.3	8	12	1.3	2	17	1.8	4	14
161	Ability to switch suppliers	3.1	10	13	4.6	8	13	4.8	10	13	4.3	7	10	3.3	5	12	3.0	5	9
162	Integrate backward	2.0	4	16	5.0	8	11	4.8	10	11	4.3	8	13	3.0	7	13	1.5	4	16
163	Distinctive product/image	6.3	10	4	5.9	8	6	7.3	10	4	6.3	10	6	6.7	8	4	7.0	8	2
164	Organizational effectiveness	7.6	10	1	6.4	10	5	6.9	10	5	7.3	9	2	9.3	10	1	8.0	9	1
165	Block existing competitors	5.8	10	5	4.9	7	12	6.8	10	6	3.3	5	16	4.7	8	10	6.3	8	4
166	Block new entrants: minimum capital required	3.6	9	10	5.0	8	10	5.9	10	8	3.3	5	17	2.3	3	15	1.8	4	11
167	Block new entrants: complexity of product	5.0	10	9	6.4	9	4	6.2	10	7	4.3	6	11	5.3	10	7	1.8	4	12
168	Block new entrants: exclusive alliances	3.6	8	11	3.7	9	16	5.1	10	10	7.0	7	3	5.0	8	9	2.3	4	10
169	Discourage substitutes: integrated products	5.3	10	7	3.8	9	15	4.4	8	16	5.3	8	7	2.3	4	16	3.3	8	8
170	Discourage substitutes: price/performance	5.3	10	8	4.0	9	14	4.5	10	15	8.0	9	1	6.0	10	6	1.5	2	15
171	Discourage substitutes: technology-based alliances	3.0	8	14	2.2	9	17	2.4	8	17	4.3	7	15	5.0	8	8	1.3	2	17

TABLE 15 Cont.

Perceived Strategic Purposes of IT

		Industry									Retail								
		A			B			C			A			B			C		
Qn	Purpose	avg	max	rnk	avg	max	rnk	avg	max	rnk	avg	max	rnk	avg	max	rnk	avg	max	rnk
155	Add value to our product	5.0	8	6	3.8	8	9	5.7	8	9	5.8	10	6	6.7	8	2	7.0	10	4
156	Tie customers to us	4.5	8	9	3.0	5	15	5.0	8	12	2.5	4	15	3.3	8	11	6.0	8	9
157	Become low-cost leader	4.8	10	7	3.0	5	17	7.5	10	4	3.8	10	12	1.0	1	17	5.0	9	12
158	Integrate forward	4.0	8	11	5.0	7	2	6.3	8	6	6.8	8	2	4.7	10	7	4.8	8	14
159	Suppliers compete for us	3.8	8	12	3.5	5	11	7.8	10	2	5.3	8	7	2.3	5	15	6.3	8	6
160	Suppliers conform to us	6.3	10	3	4.3	6	6	8.2	10	1	5.3	9	8	5.7	8	4	6.3	9	7
161	Ability to switch suppliers	6.0	10	4	4.0	5	7	7.5	10	3	6.8	9	3	4.7	7	5	5.5	7	11
162	Integrate backward	6.8	8	2	4.8	8	3	6.2	10	7	6.5	8	4	3.0	6	13	6.3	8	8
163	Distinctive product/image	5.5	8	5	4.5	8	4	5.2	9	10	7.0	9	1	6.3	9	3	7.0	9	3
164	Organizational effectiveness	7.3	10	1	6.5	10	1	5.8	10	8	6.5	9	5	7.7	9	1	8.0	9	1
165	Block existing competitors	4.3	7	10	3.0	4	16	4.0	9	15	3.3	8	14	4.0	7	9	5.8	8	10
166	Block new entrants: minimum capital required	3.0	5	14	3.3	5	14	4.7	9	13	4.0	8	11	3.0	5	14	4.8	7	13
167	Block new entrants: complexity of product	3.3	6	13	4.0	7	8	4.7	9	14	4.3	8	10	4.3	7	8	6.8	8	5
168	Block new entrants: exclusive alliances	2.8	6	15	3.3	5	12	3.8	9	16	2.0	4	16	2.0	4	16	7.5	8	2
169	Discourage substitutes: integrated products	2.5	5	16	3.3	5	13	5.2	9	11	3.5	8	13	4.7	7	6	4.8	8	15
170	Discourage substitutes: price/performance	4.5	8	8	4.3	7	5	6.7	10	5	5.3	8	9	3.7	7	10	3.8	7	17
171	Discourage substitutes: technology-based alliances	2.3	4	17	3.8	5	10	3.7	8	17	1.0	2	17	3.3	5	12	4.0	7	16

TABLE 16

Perceived Strategic Uses of IT

Notes:

A = Automation of office processes (Question 174)
B = Automation of factory processes (Question 175)
C = Automation of controls (Question 176)
D = Inter-organizational systems (Question 177)
E = Professional support (Question 178)
F = Automating the client interface (Question 179)
G = Management information/ decision support (Question 180)

N = Number of usable responses

TABLE 16 Cont.

Perceived Strategic Uses of IT

Strategic Purpose	Finance													
	Business (B)							IT (C)						
	No. of "Votes" Cast (N = 8)							No. of "Votes" Cast (N = 11)						
	A	B	C	D	E	F	G	A	B	C	D	E	F	G
Add value to our product	3	0	0	0	4	5	2	4	0	1	3	5	6	4
Tie customers to us	1	1	0	2	2	1	2	1	0	0	3	1	4	2
Become low-cost leader	7	2	4	4	1	0	2	9	1	2	2	1	3	4
Integrate forward	0	0	0	1	0	2	0	1	0	0	1	0	1	1
Suppliers compete for us	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Suppliers conform to us	0	0	0	0	1	0	0	0	1	0	0	0	0	1
Ability to switch suppliers	0	0	0	0	0	0	0	1	0	0	1	0	0	1
Integrate backward	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Distinctive product/image	1	0	0	1	3	3	2	6	0	0	1	3	4	2
Organizational effectiveness	6	0	4	3	1	0	4	10	2	7	1	2	3	9
Block existing competitors	1	0	1	2	0	3	1	2	0	1	0	0	2	2
Block new entrants: minimum capital required	2	1	1	1	0	2	0	1	1	1	2	0	0	1
Block new entrants: complexity of product	1	0	0	2	0	3	3	1	1	1	2	1	1	2
Block new entrants: exclusive alliances	0	0	0	4	0	3	2	1	0	1	3	1	3	0
Discourage substitutes: integrated products	0	0	0	2	0	1	0	1	0	1	3	4	4	0
Discourage substitutes: price/performance	2	0	1	1	0	0	0	3	0	0	3	2	1	2
Discourage substitutes: technology-based alliances	1	0	0	2	0	1	0	0	0	1	3	1	1	0
	25	5	11	25	12	24	18	41	6	16	28	21	33	33

Strategic Purpose	Oil													
	Business (B)							IT (C)						
	No. of "Votes" Cast (N = 2)							No. of "Votes" Cast (N = 2)						
	A	B	C	D	E	F	G	A	B	C	D	E	F	G
Add value to our product	1	0	0	0	0	0	0	0	0	0	0	0	1	1
Tie customers to us	0	0	0	1	0	1	1	0	0	0	0	0	1	0
Become low-cost leader	2	1	2	0	0	0	1	1	1	1	0	0	0	0
Integrate forward	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Suppliers compete for us	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Suppliers conform to us	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ability to switch suppliers	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Integrate backward	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Distinctive product/image	0	0	0	0	0	1	0	0	0	0	0	0	2	1
Organizational effectiveness	2	0	1	0	0	0	2	2	1	1	1	0	1	1
Block existing competitors	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block new entrants: minimum capital required	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block new entrants: complexity of product	1	1	0	0	0	1	0	0	0	0	0	0	0	0
Block new entrants: exclusive alliances	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discourage substitutes: integrated products	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discourage substitutes: price/performance	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Discourage substitutes: technology-based alliances	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8	3	3	2	0	3	4	3	2	2	1	0	5	3

TABLE 16 Cont.

Perceived Strategic Uses of IT

Strategic Purpose	Industry: Business (B) No. of "Votes" Cast (N = 4) A	B	C	D	E	F	G	Industry: IT (C) No. of "Votes" Cast (N = 6) A	B	C	D	E	F	G	Retail: Business (B) No. of "Votes" Cast (N = 2) A	B	C	D	E	F	G	Retail: IT (C) No. of "Votes" Cast (N = 3) A	B	C	D	E	F	G
Add value to our product	1	1	0	1	1	0	1	0	2	1	1	1	0	1	0	0	0	0	0	1	1	0	0	0	0	1	0	0
Tie customers to us	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Become low-cost leader	0	0	0	0	0	0	0	1	3	1	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Integrate forward	1	1	0	1	1	1	1	2	0	1	1	1	2	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Suppliers compete for us	0	0	0	0	0	0	1	2	0	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Suppliers conform to us	1	2	1	1	0	0	0	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Ability to switch suppliers	0	0	0	0	0	0	0	3	0	1	1	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Integrate backward	1	1	0	1	1	0	0	2	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0
Distinctive product/image	2	0	1	1	1	2	1	1	0	0	1	1	1	1	0	0	0	0	0	1	0	0	1	1	0	1	2	0
Organizational effectiveness	2	1	2	2	2	1	2	3	0	2	2	0	1	2	1	0	2	0	0	1	1	3	1	2	0	1	0	3
Block existing competitors	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Block new entrants: minimum capital required	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block new entrants: complexity of product	1	0	0	0	1	1	1	0	0	1	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	2	1
Block new entrants: exclusive alliances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Discourage substitutes: integrated products	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Discourage substitutes: price/performance	1	1	0	0	1	1	0	0	0	1	0	0	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Discourage substitutes: technology-based alliances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	7	4	7	8	6	7	16	6	12	13	4	12	16	1	0	2	2	0	4	5	3	3	3	3	4	8	9

TABLE 17

Reactions to the Questionnaire

Notes: Usable responses:

Finance: A = 10; B = 10; C = 13
Other: A = 12; B = 11; C = 14

185 The Task of Filling It In

		Tedious -2	-1	0	+1	Interesting +2
Financial Companies	A:	20	10	20	50	0
	B:	20	20	30	30	0
	C:	0	38	39	23	0
Other Companies	A:	0	17	50	25	8
	B:	18	27	0	55	0
	C:	7	21	36	36	0

186 Insights Gained

		Few -2	-1	0	+1	Many +2
Financial Companies	A:	50	30	10	10	0
	B:	30	10	10	50	0
	C:	31	38	23	8	0
Other Companies	A:	17	25	25	25	8
	B:	36	9	28	27	0
	C:	14	21	29	36	0

187 Useful as Aide-Memoire

		Much -2	-1	0	+1	Little +2
Financial Companies	A:	20	0	10	20	50
	B:	0	30	30	10	30
	C:	0	8	38	31	23
Other Companies	A:	8	50	26	8	8

APPENDIX H

FIGURES

FIGURE 1

The Components and Parts of the Framework

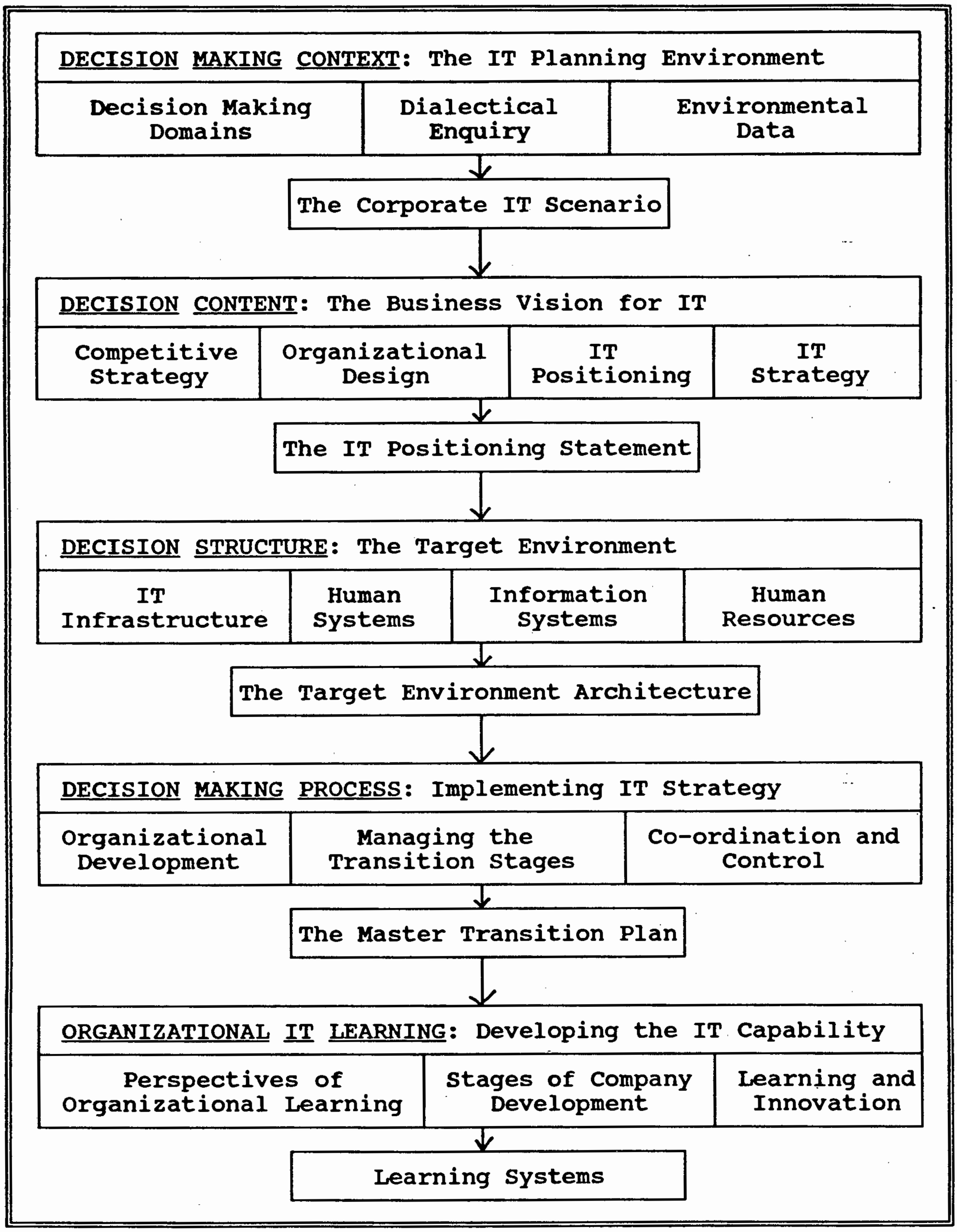


FIGURE 2

The Links of the Framework

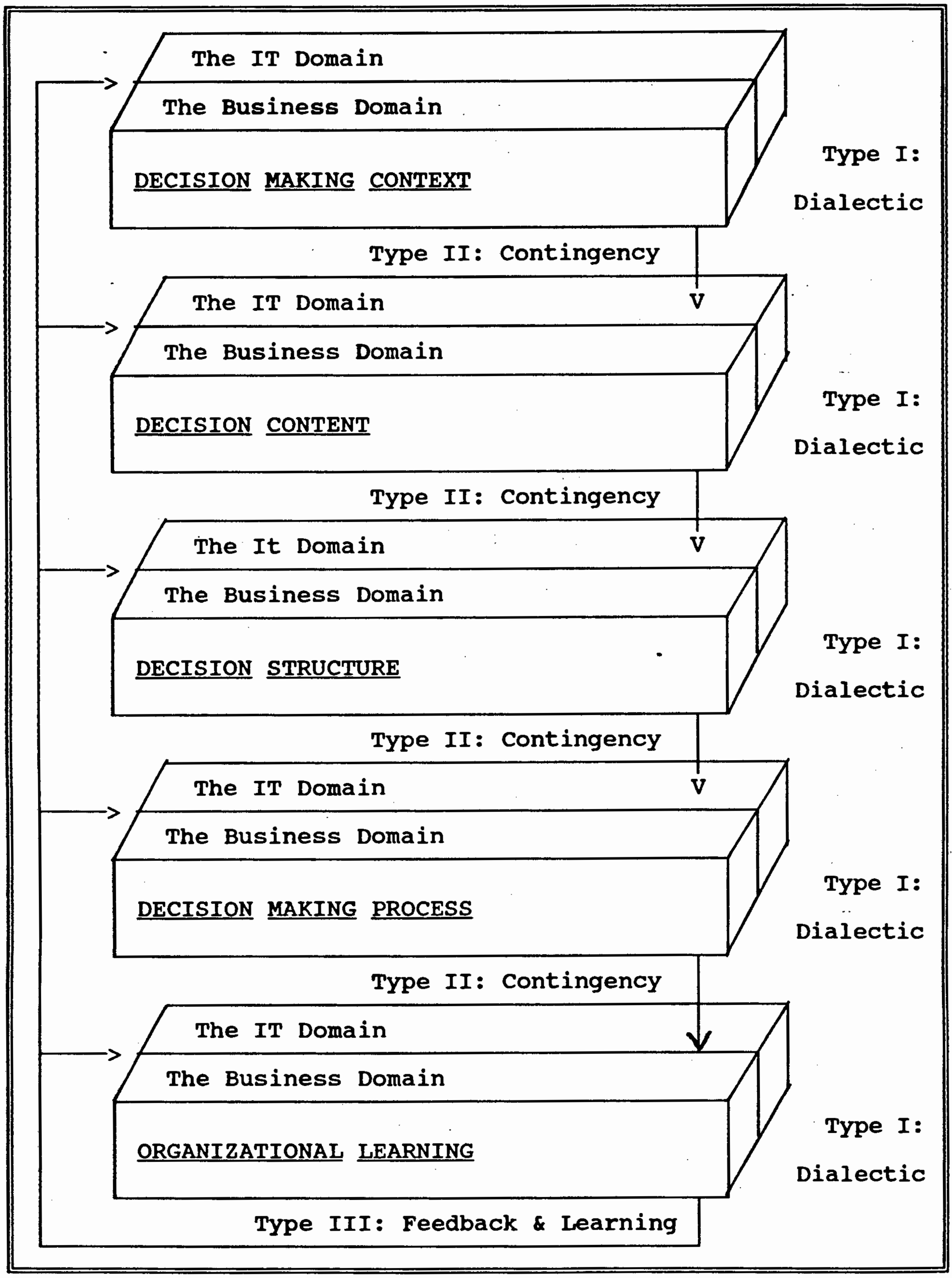
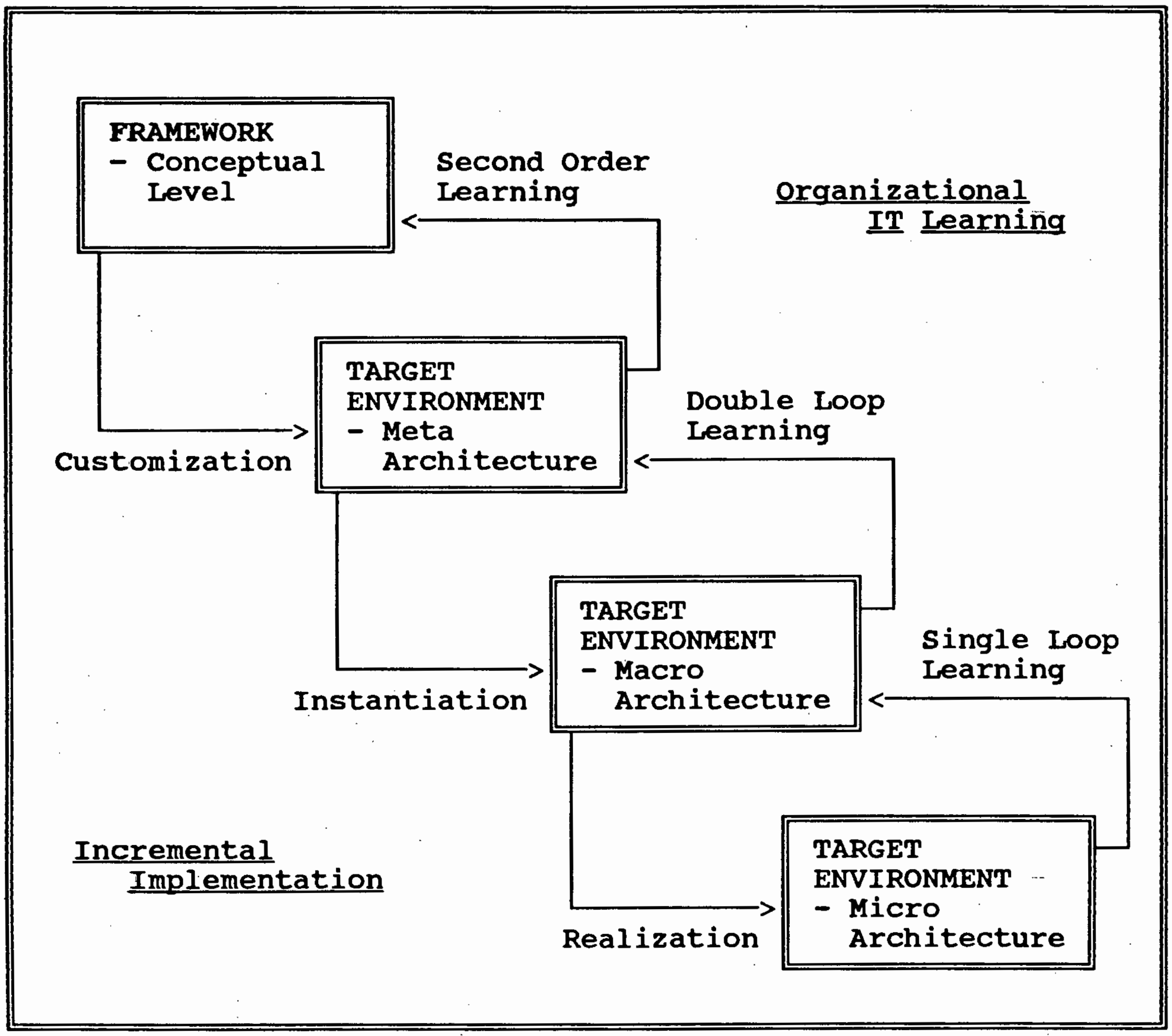


FIGURE 3

Type III Links: Feedback & Learning



Adapted from Online People [Seminar E-01: Plate 4]

FIGURE 4

Organizational Dialectic

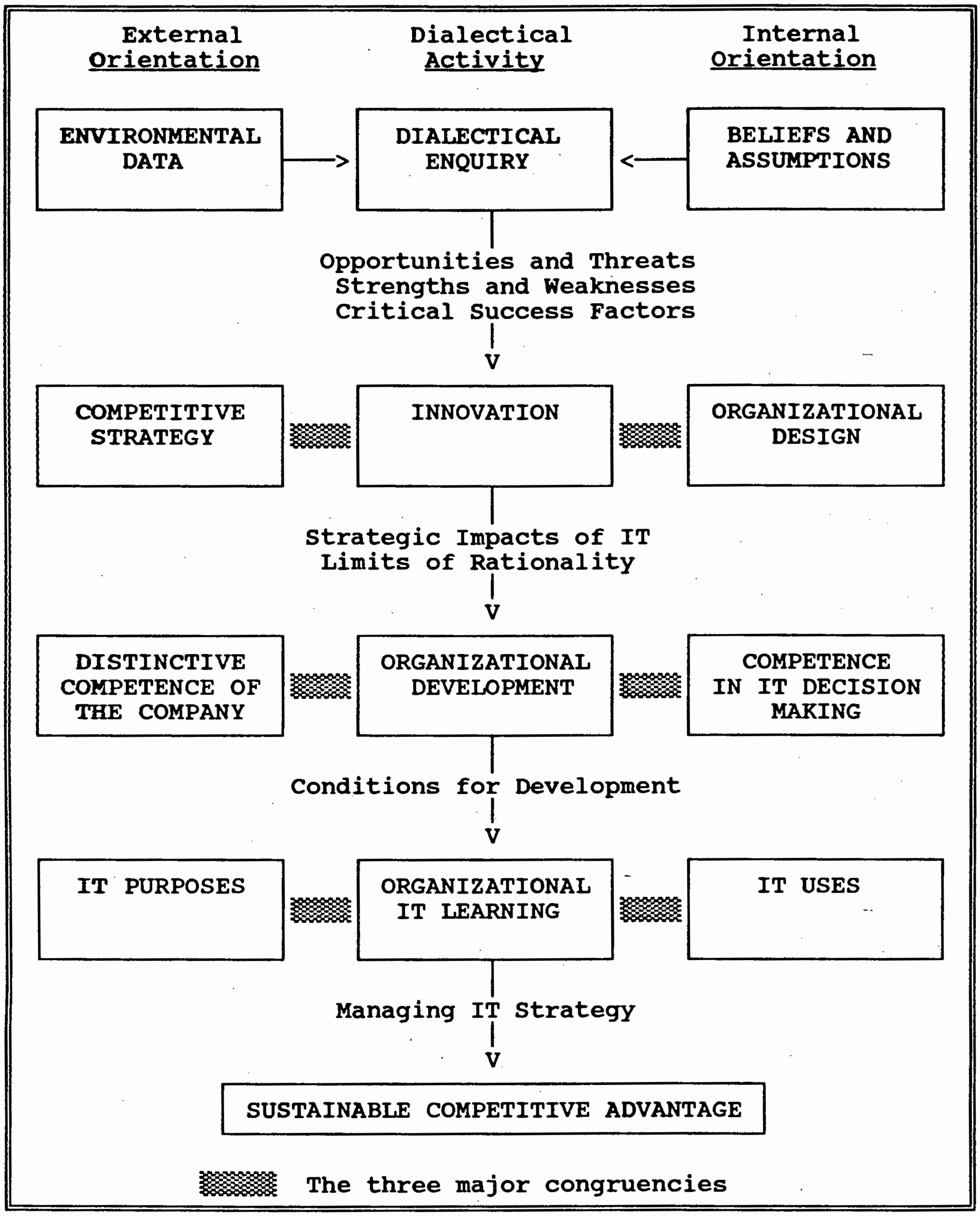


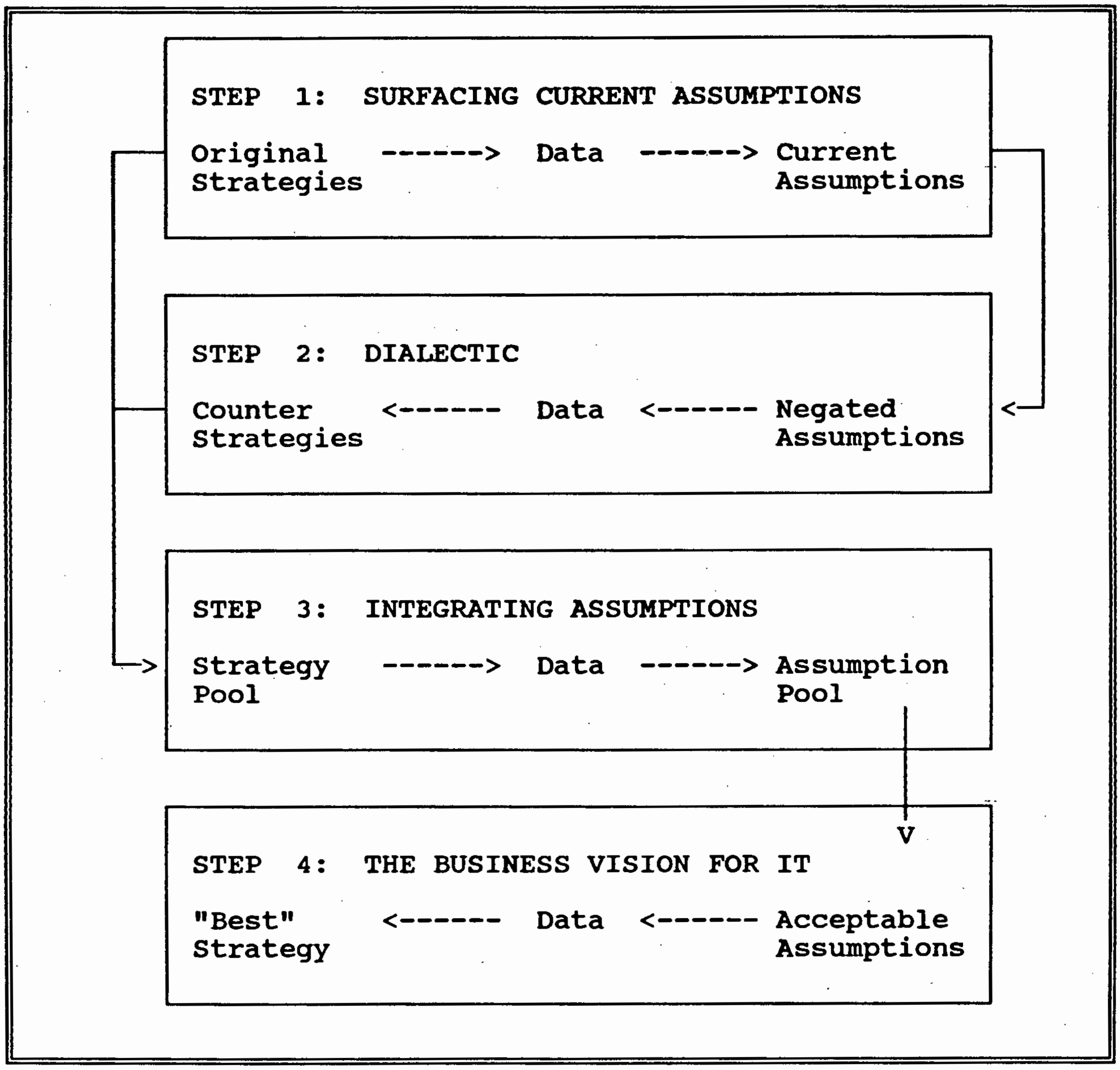
FIGURE 5

Decision Making Domains

	BUSINESS	IT
OUTSIDE THE SYSTEM	A. OWNERS Commission Systems and Infrastructure	B. DEVELOPERS Build Systems and Infrastructure
INSIDE THE SYSTEM	C. USERS Use Systems and Infrastructure	D. OPERATORS Manage Systems and Infrastructure

FIGURE 6

Stating, Negating and Restating Assumptions



Adapted from Mitroff & Emshoff [1979: 5]

FIGURE 7

Environmental Data

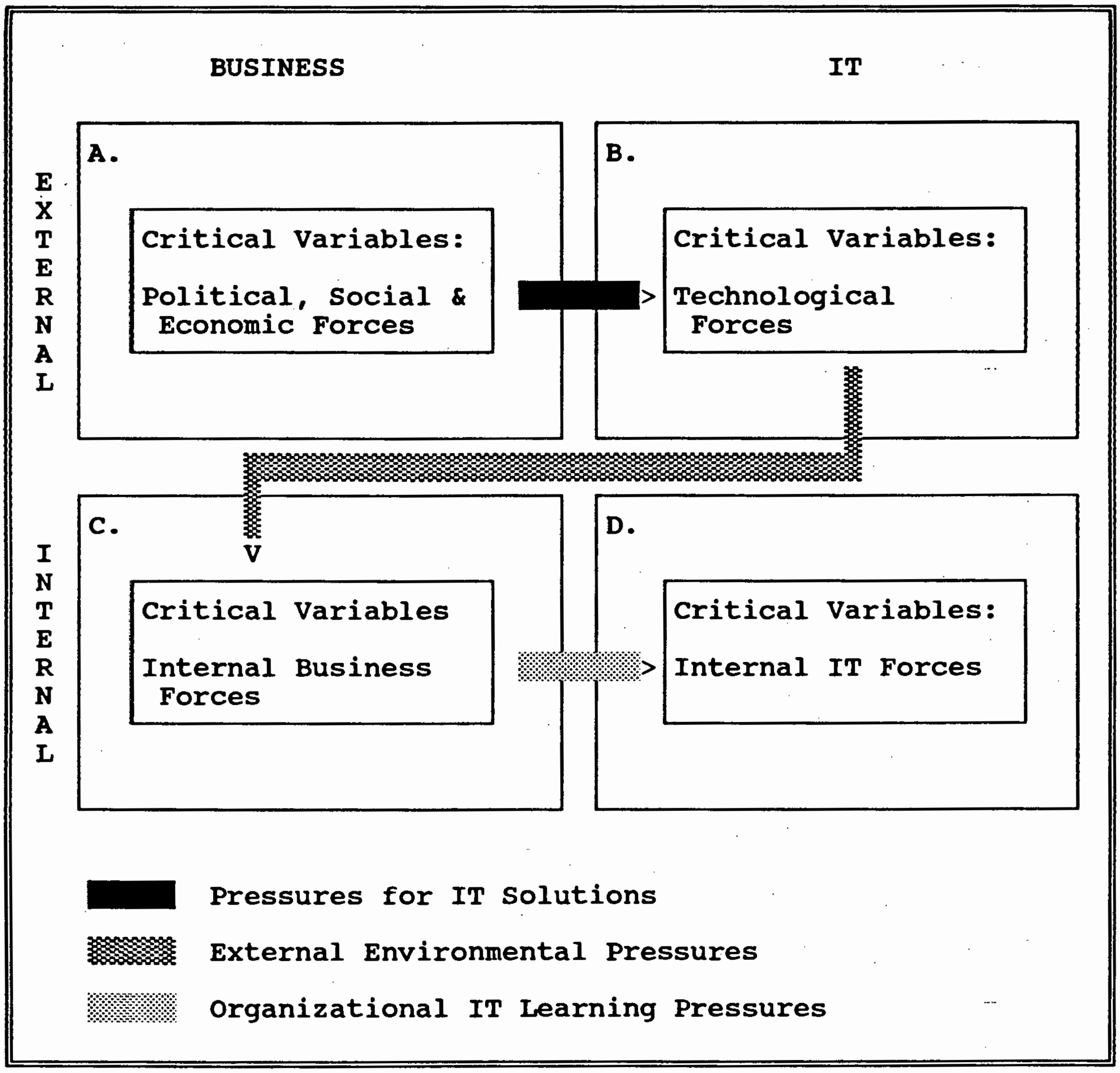


FIGURE 8

The Quadrants of IT Strategy

Pressures of Change

Pressures of Change

	The Business Domain	The IT Domain	
EXTERNAL	A COMPETITIVE STRATEGY Strategic Impacts Company Mission Competitive Strategy The Purposes of IT	B IT POSITIONING IT Strategy Evaluation Investment Focus Competitive Advantage Appropriate Technology	EXTERNAL
INTERNAL	C ORGANIZATIONAL DESIGN Organizational Impacts Strategic Capability Organizational Design The Uses of IT	D IT STRATEGY Technology Strategy The Target Environment Management Strategy	INTERNAL

Adapted from Benson & Parker [1985: 19]

FIGURE 9

Technology Strategy for IT: Alignment or Impact

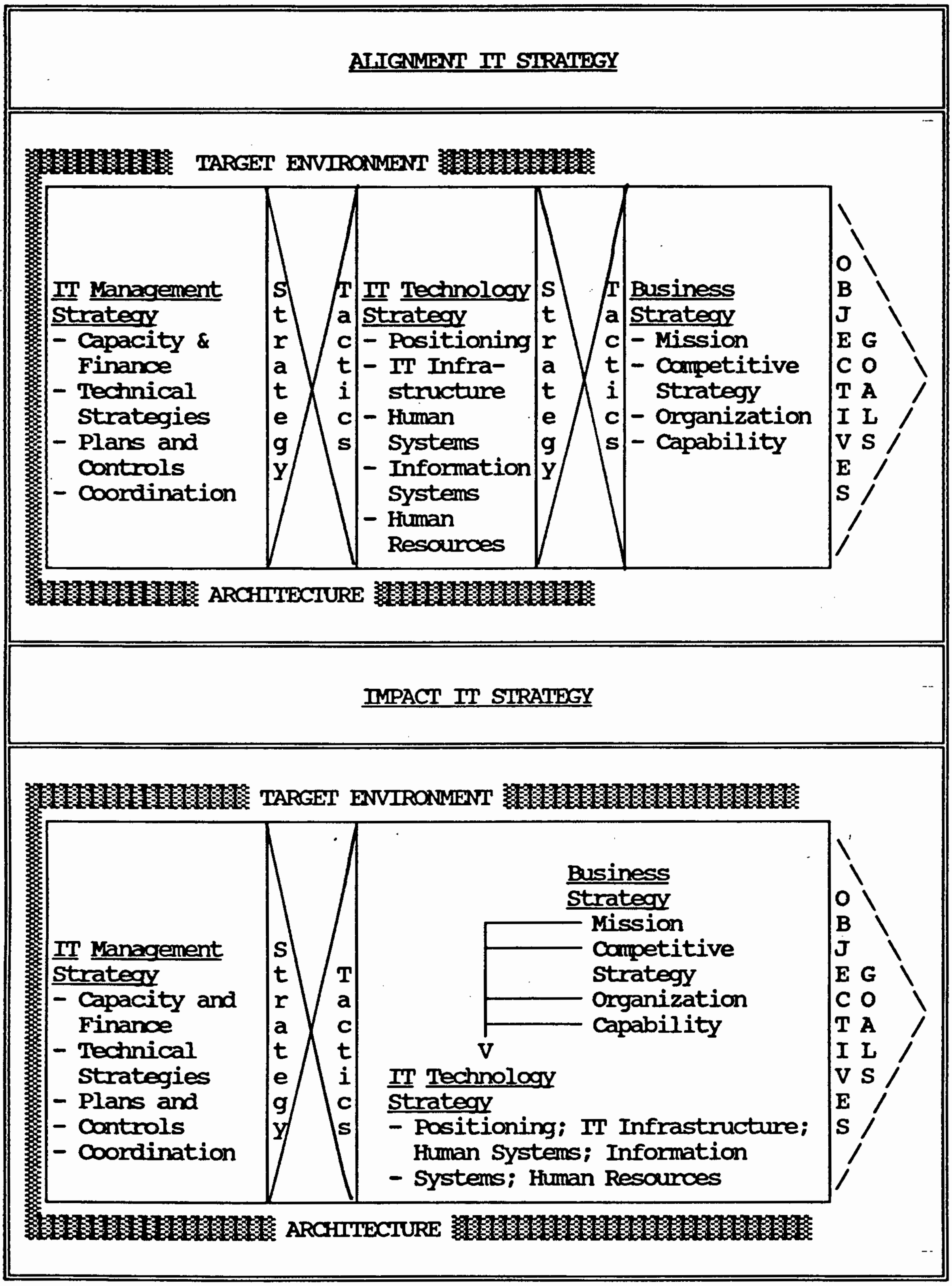


FIGURE 10

Strategic Purposes of IT

Strategic Target	Threat to Company by the Target	Purposes of IT in Meeting the Threat
Supplier	Higher prices Reduced quality Reduced service	D: Encourage competition for company's business; reduce switching costs C: Enforce "just-in-time" scheduling S: Threaten backward integration
Buyer	Lower prices Higher quality More services More competition	D: Marketing-mix; increase buyer switching costs C: Low-cost leadership S: Forward integration
Existing Rival	Competition on price, product, distribution, service	D: Differentiate product, service, company C: Cost effectiveness S: Control access to buyers
New Entrants	New capacity Reduced prices Inflated costs for incumbents	D: Marketing-mix; switching costs; complex systems C: Raise "ante", i.e. need for substantial resource S: Strategic alliances to control market access
Substitute Products	Reduced turnover or margins Ceiling on prices	D: Redefine products and services C: Improve price and performance S: Strategic alliances for diversification
D = Differentiation; C = Cost; S = Scope		

Adapted from Cash J.J. & Konsynski B.R. [1985: 139]

FIGURE 11

Strategic Option Generator

What is the Strategic Target?		
Supplier	Customer	Competitor

V

What is the Generic Strategy?				
Differentiation	Cost	Innovation	Growth	Alliance

V

What is the Mode?	
Competitive - Alignment	Entrepreneurial - Impact

V

What is the Level of Use?			
Personal	Work Group	Business Unit	Corporate

V

What is the Class of Use?		
Automation	Information	Control

V

What is the Competitive Advantage?		
Competitive Position	Organizational Effectiveness	Synergy

Based on Wiseman [1985: 57]

FIGURE 12

The IT Strategy Evaluation Grid

Strategic impact of new infrastructure and applications

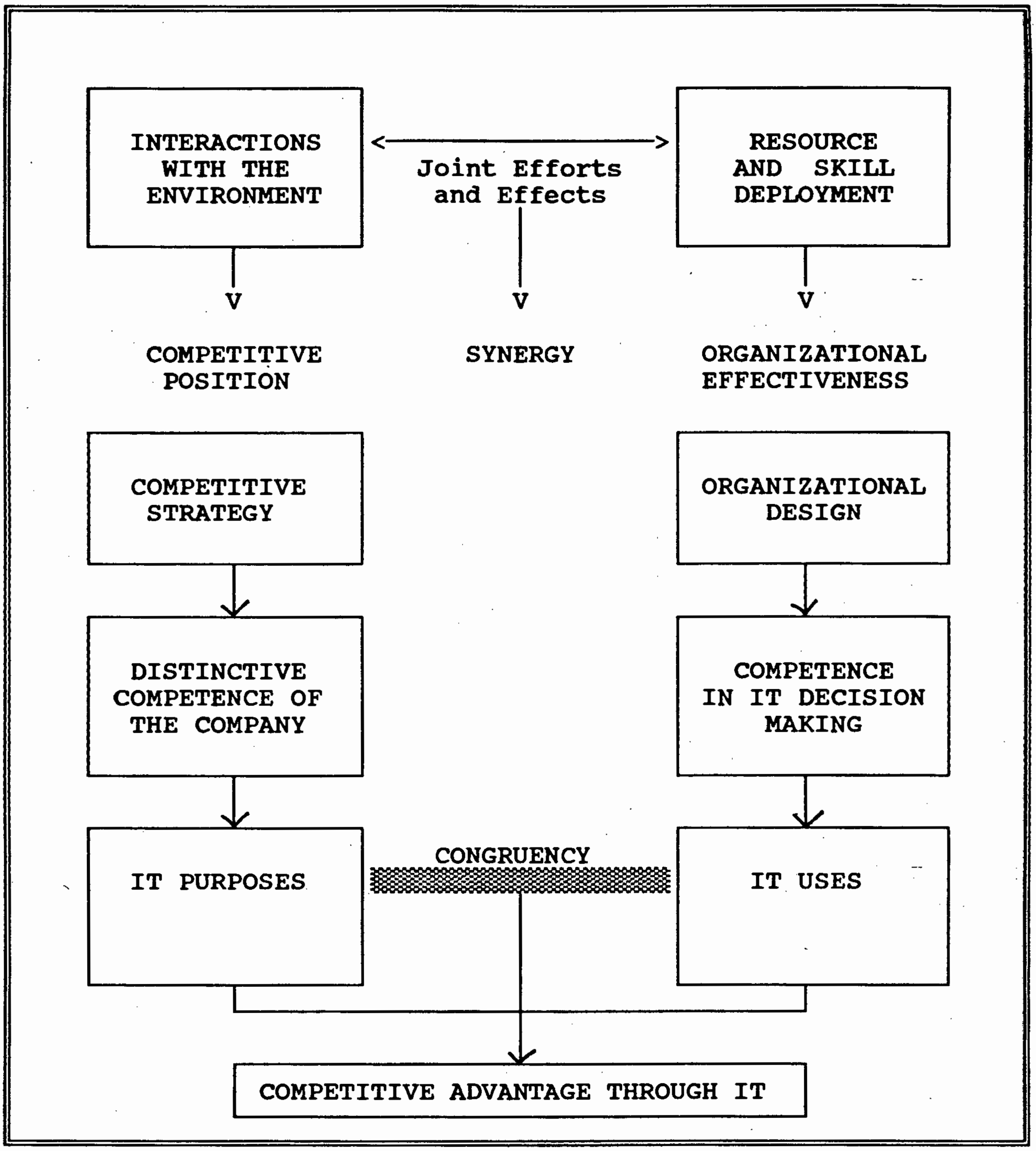
Strategic impact of existing infrastructure and applications		Low	High
	Low	**SUPPORT** ITS: Alignment BLC: Decline BCG: Dogs	**TURNAROUND** ITS: Impact BLC: Introduction BCG: Question Marks
	High	**FACTORY** ITS: Alignment BLC: Maturity BCG: Cash Cows	**STRATEGIC** ITS: Impact BLC: Growth BCG: Stars

Key: ITS: Information Technology Strategy
BLC: Business Life Cycle
BCG: Boston Consulting Group Matrix

Adapted from Cash, McFarlan & McKenney [1983: 217] and Deshpandé & Parasuraman [1986, Fig 6.]

FIGURE 13

Measuring Competitive Advantage through IT



Note: See also Figure 4

FIGURE 14

The Target Environment Architecture

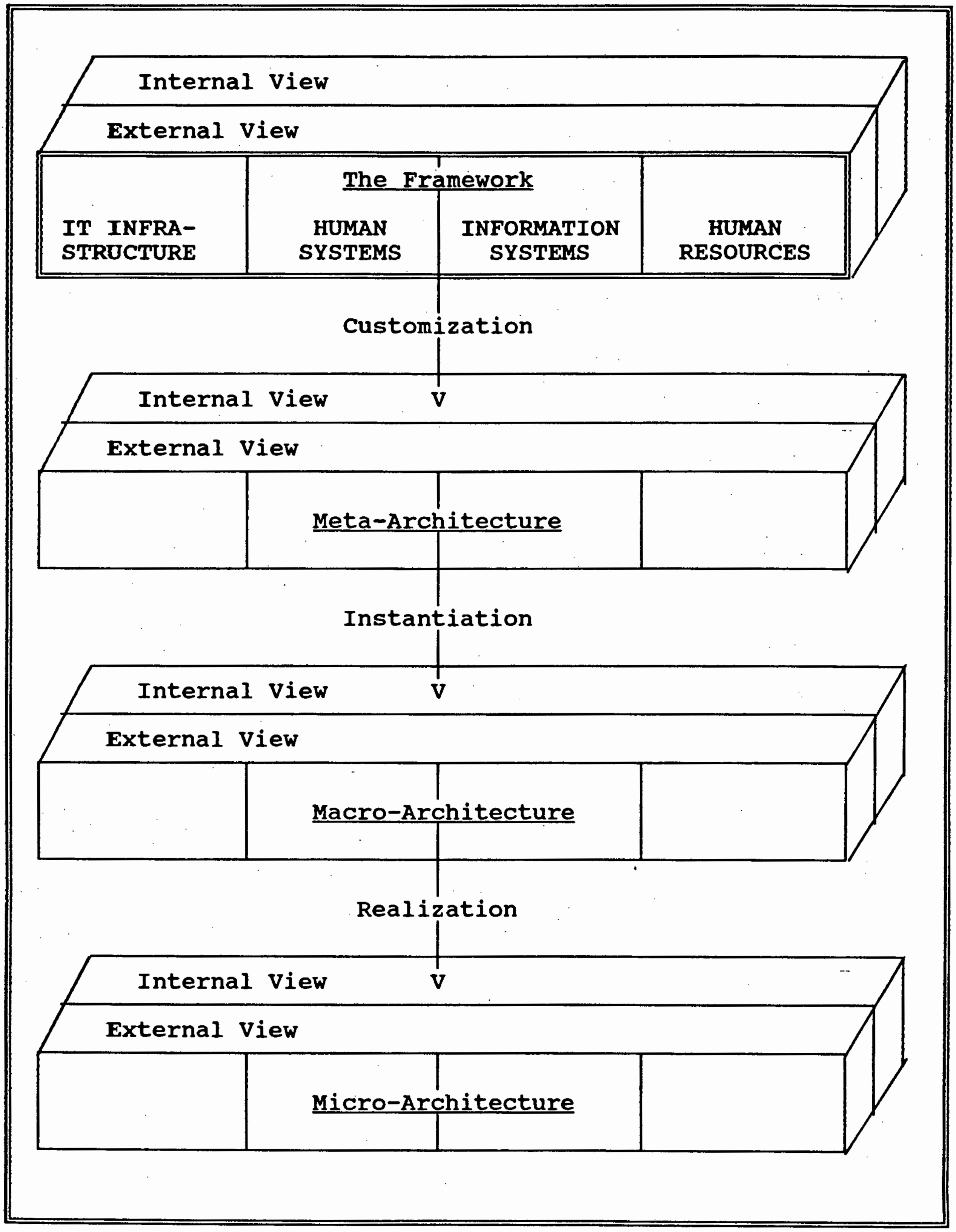
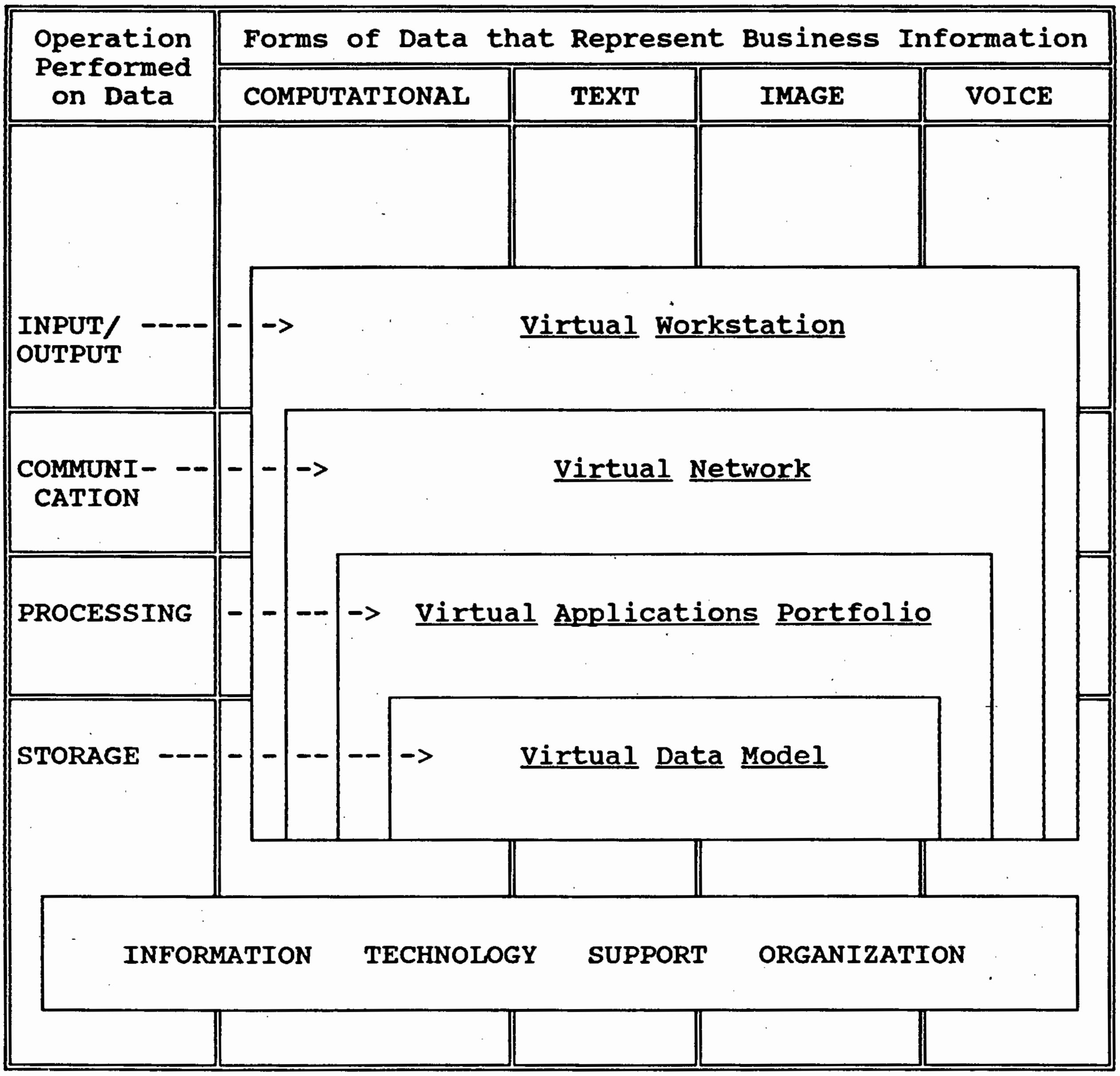


FIGURE 15

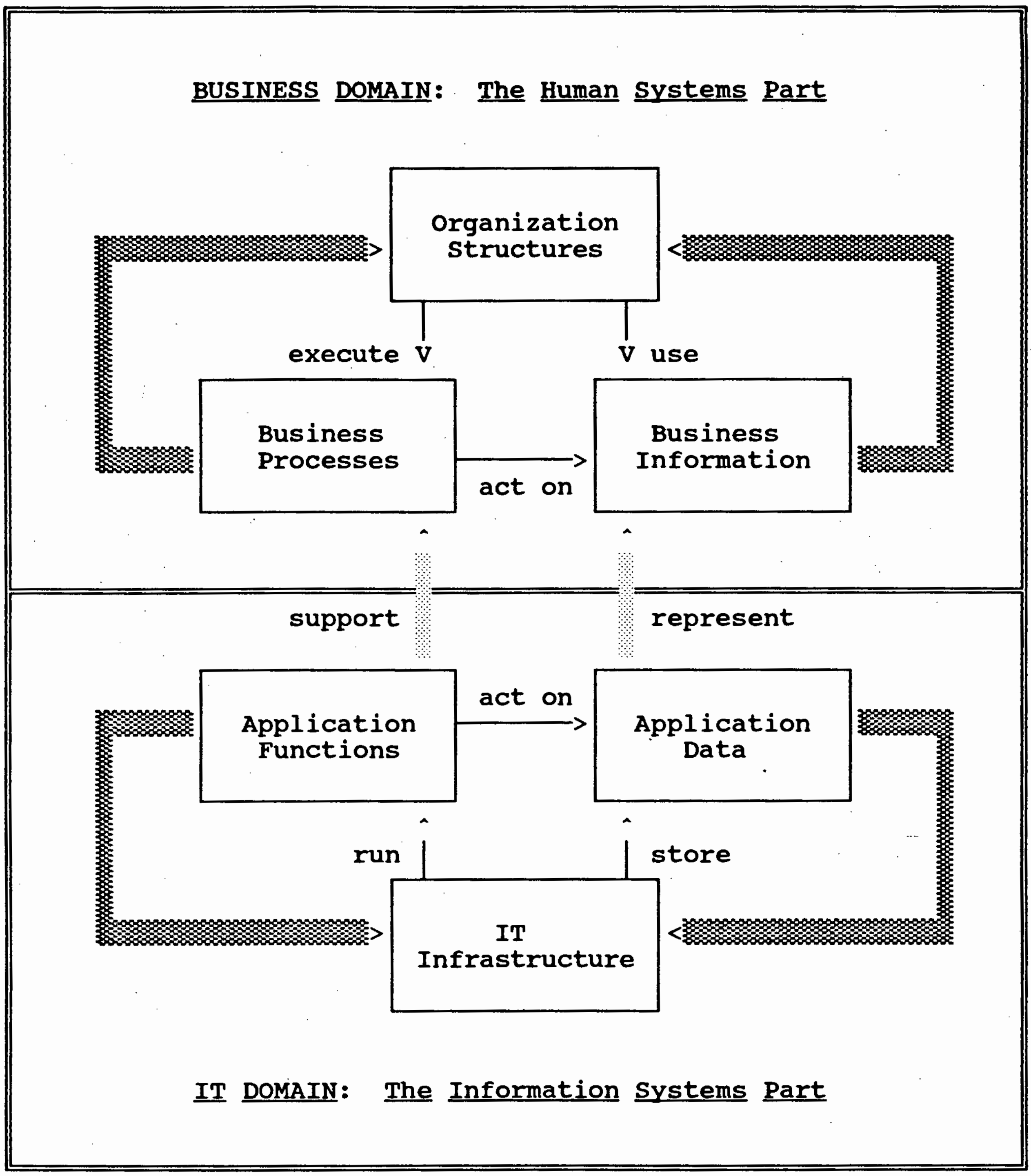
The IT Infrastructure



Adapted from Campbell [1982: 191]

FIGURE 16

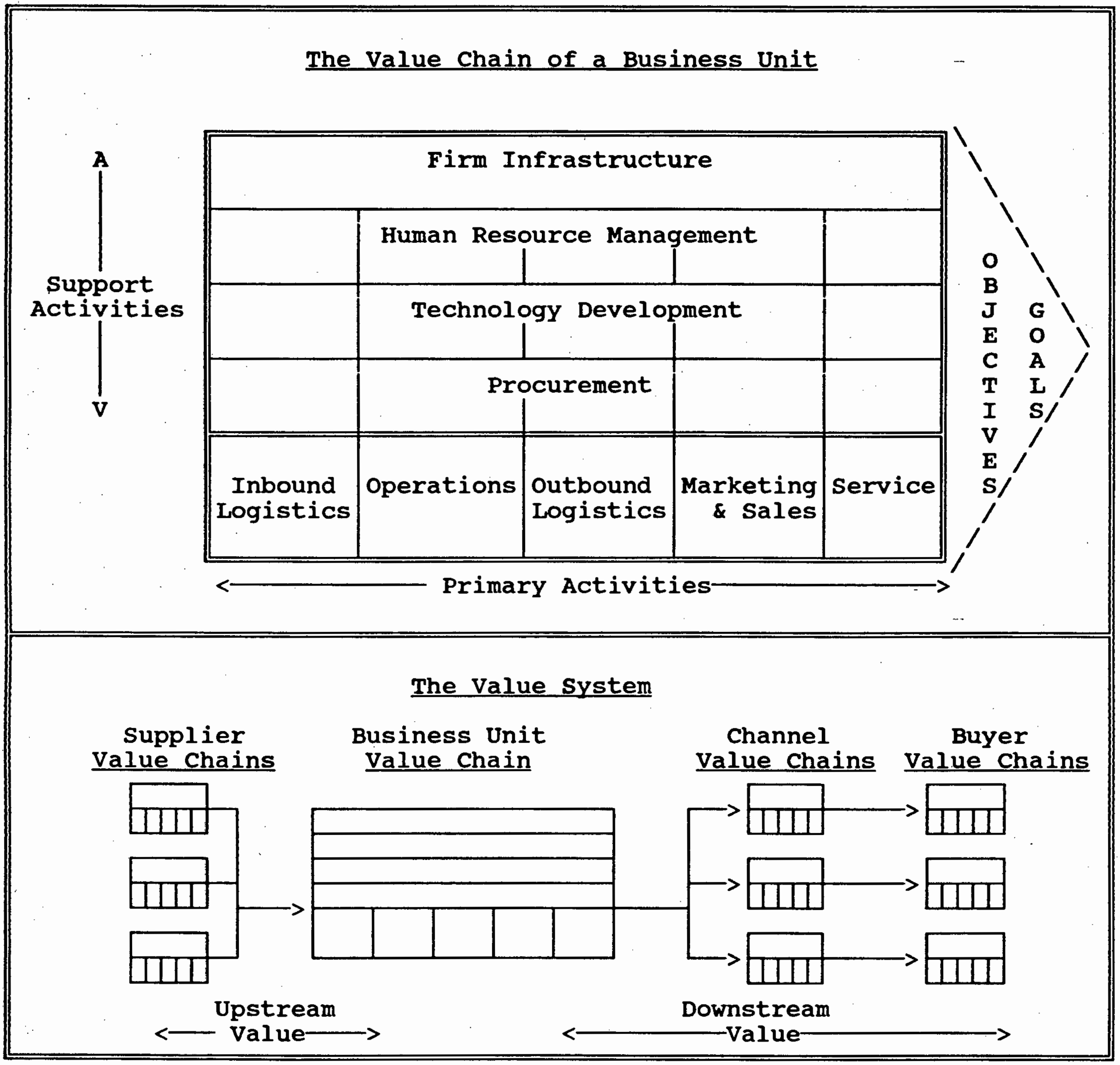
Business Systems Architecture



Adapted from Bascom & Kent [1984: Figures 1 & 5]

FIGURE 17

The Value Chain and Value System



Adapted from Porter & Millar [1985: 151]

FIGURE 18

Strategic Applications Portfolio

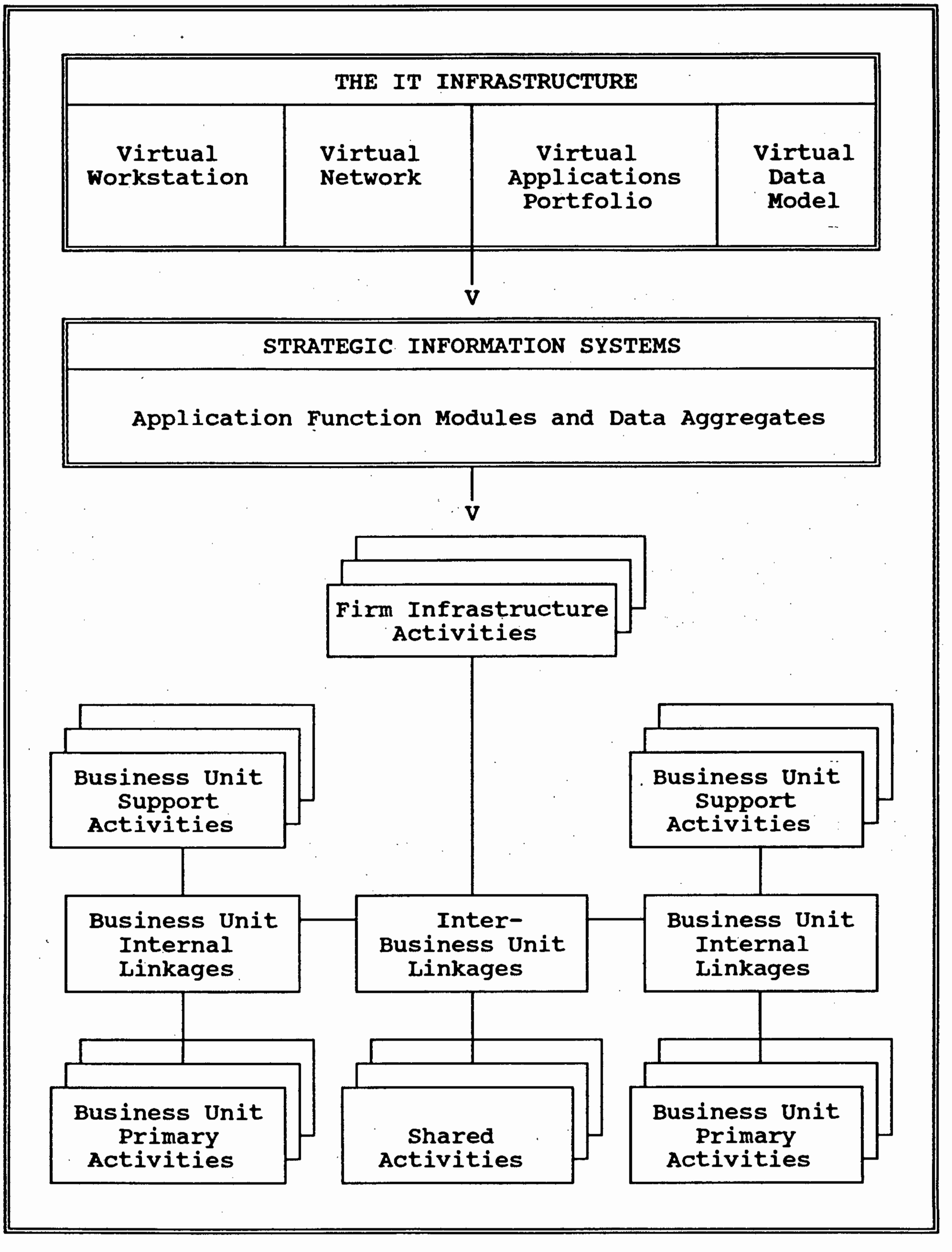


FIGURE 19

Strategic IT Decision Making Roles

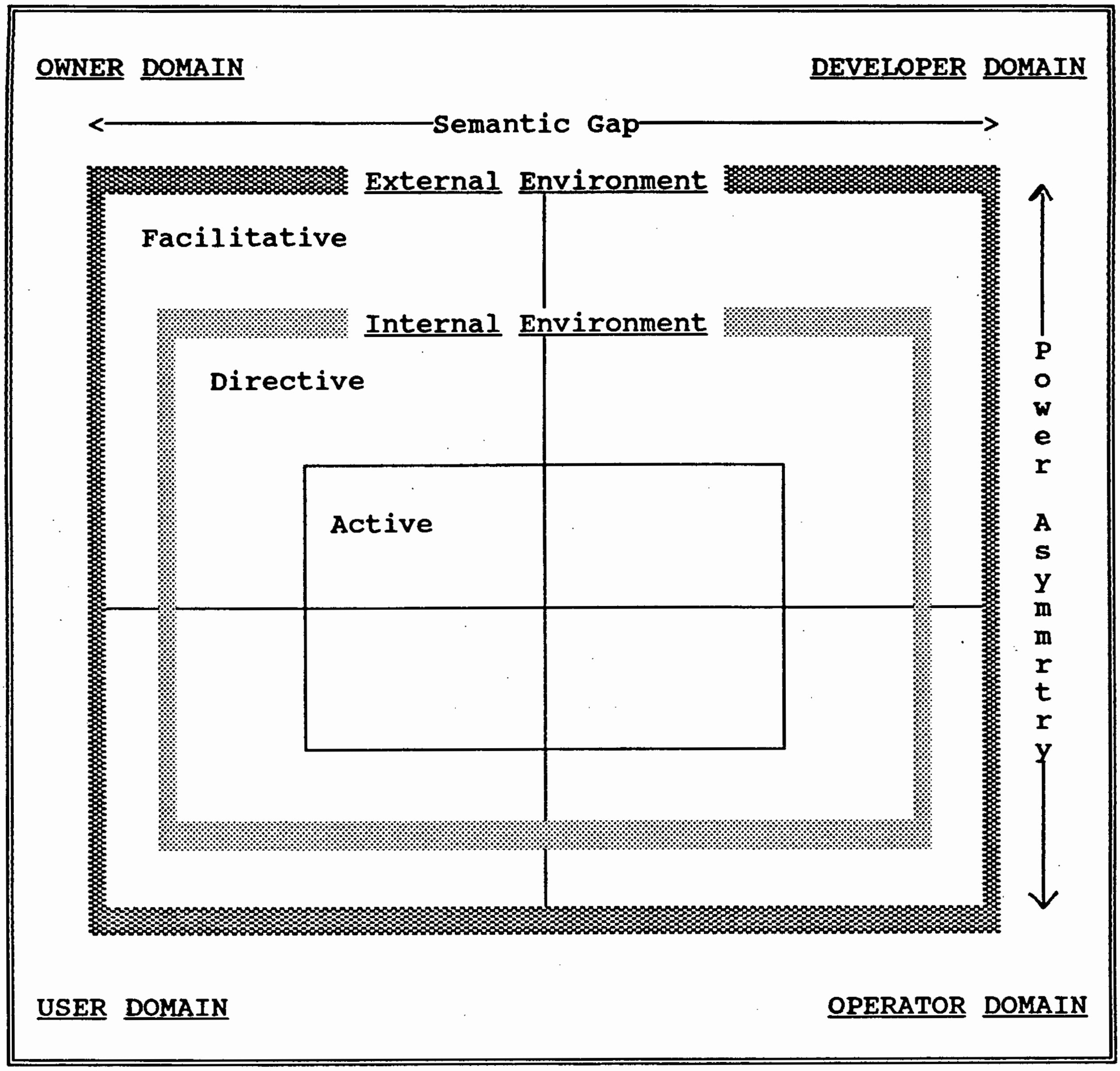


FIGURE 20

Strategic IT Decision Making Responsibilities

(Fragment of a Responsibilities Chart)

GENERIC ROLES			GENERIC TASKS:				
			STEERING COMM:			ARCHITECTURE:	
Level	Domain	#	1	2	n	1	2
Facilitative	Owner	1					
		2					
		n					
	Developer	1					
		2					
		n					
	Operator						

Adapted from Beckhard & Harris [1977: 78]

FIGURE 21

Strategic IT Decision Making Success Criteria

A. OWNERS Externally Valid: Increase in turnover, market share, margins; decrease in cost of value activity or linkage; increase in quality of service; venture success Internally Valid: Managed quantity and quality of information, communication; workgroup efficiency; margin per headcount; employee skills and morale	B. DEVELOPERS Externally Valid: Improved rates of assimilation and development lead times; decrease in volume and back-log of changes Internally Valid: Design quality; system performance; information intensity of work process; functionality of the application
C. USERS Externally Valid: increases in workgroup and personal effectiveness; prompter service; higher workshop throughput; reduction in efficiency variances Internally Valid: shorter and simpler training needs; fewer errors; easier supervision; projects shorter and more successful	D. OPERATORS Externally Valid: Better use of capacity; improvement in service levels agreed and met; reduction in spoilt work Internally Valid: Better machine loading; better reliability, availability and serviceability; more efficient and motivated technical staff; better vendor support;

FIGURE 22

The Master Transition Plan

(Fragment)

TRANSITION STAGE	TARGET ENVIRONMENT DIMENSION				REQUIRED STRATEGIC MANAGEMENT PROCESSES
	IT Infra-structure	Human Systems	Information Systems	Human Resource	
Scope:	Company	Business Unit	Business Unit	Company	Company
I Name Timeframe	Thrust 1				
	Thrust 2				
II Name Timeframe	Thrust 3				
III	Thrust 4				

FIGURE 23

IT Management Strategy and Controls

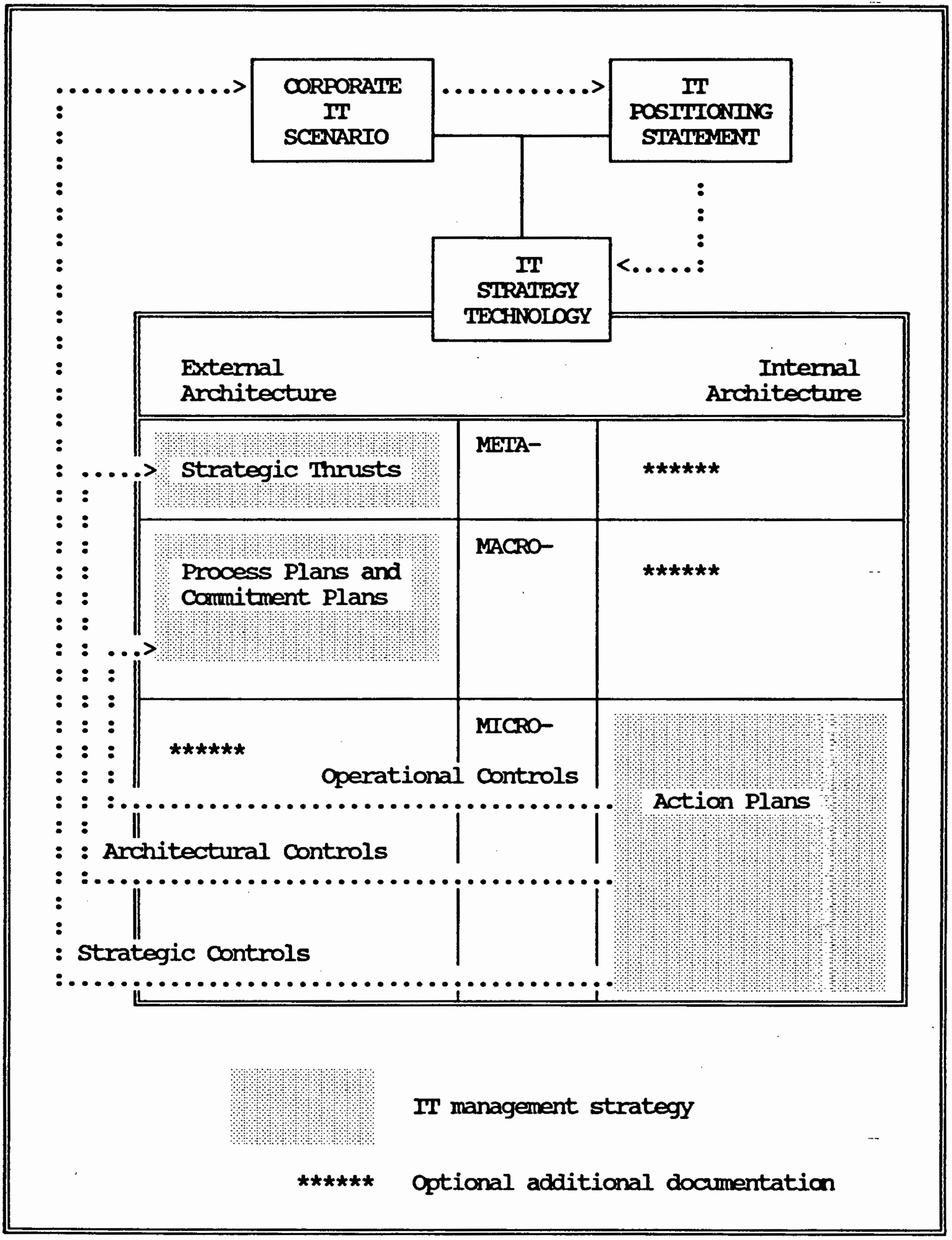


FIGURE 24

Aggregate Classes of Strategic IT Costs

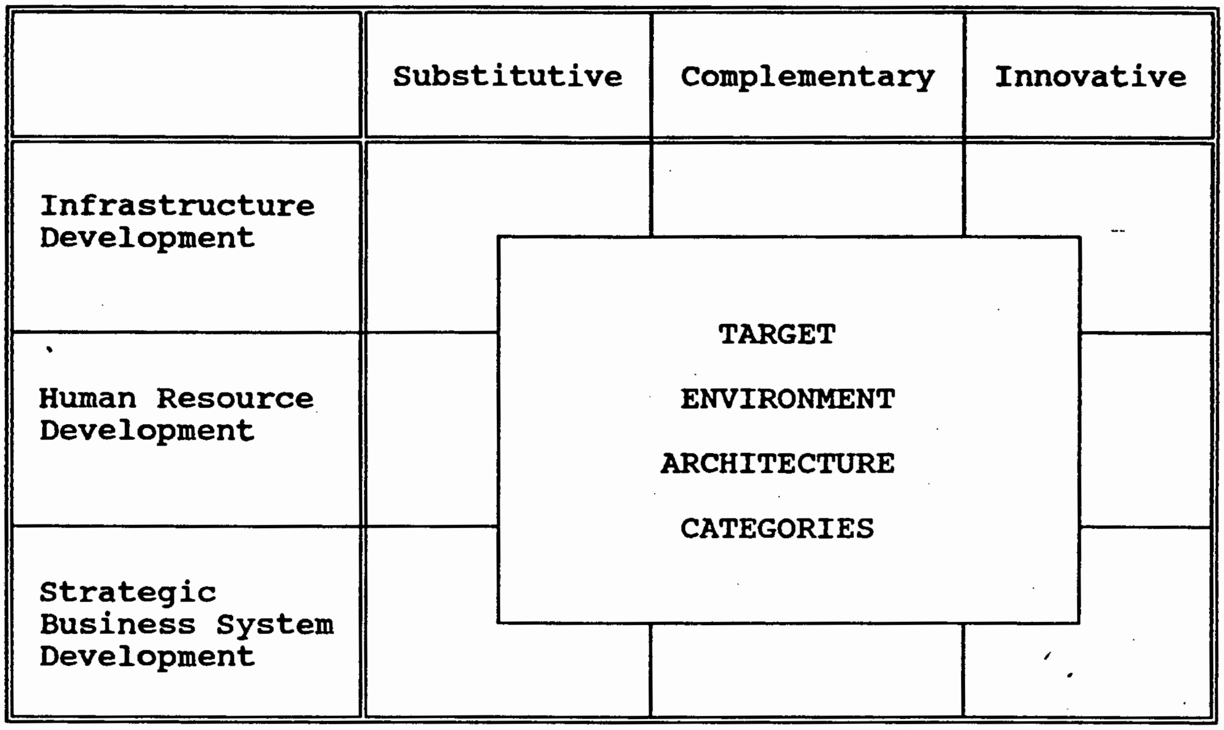


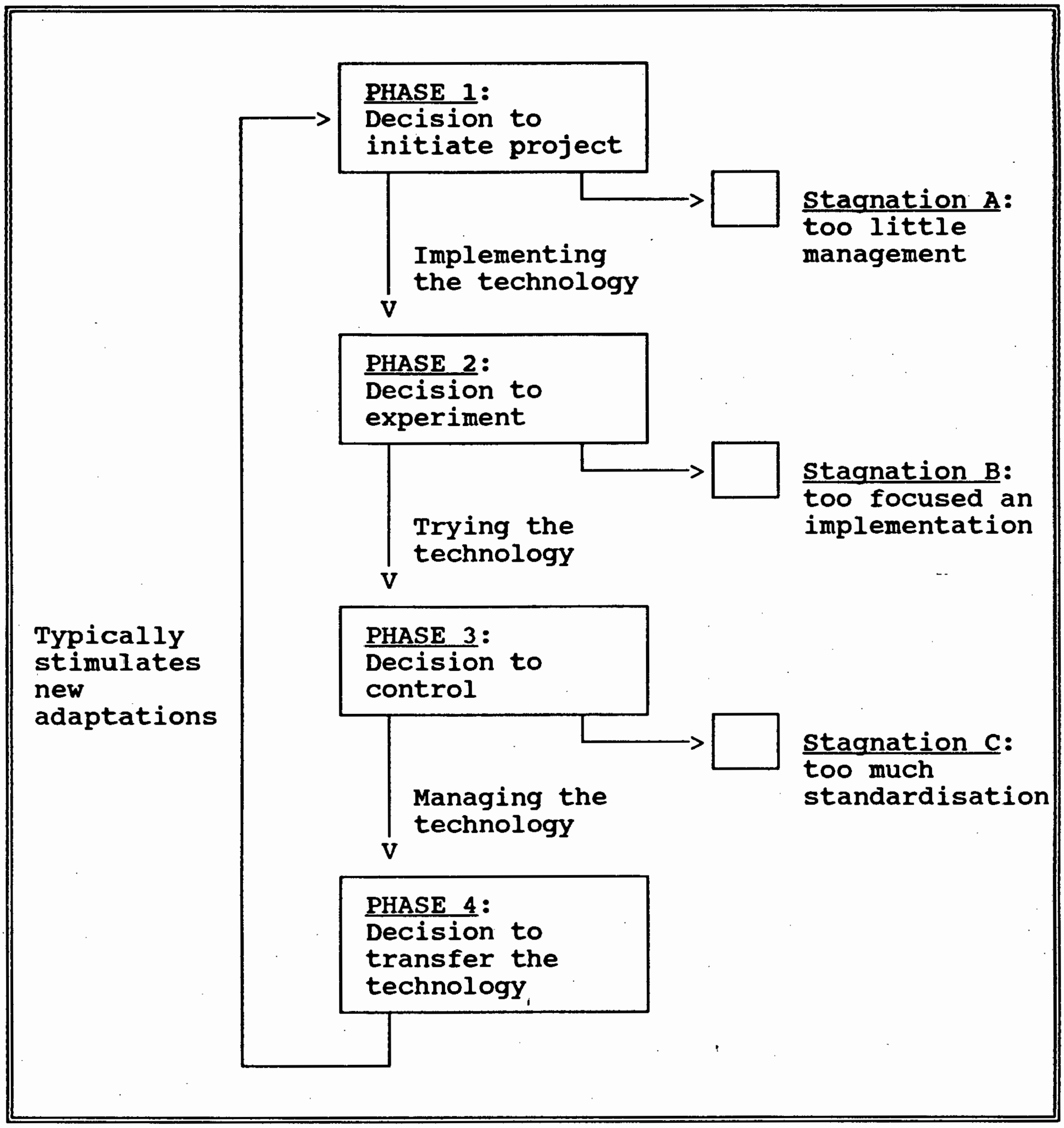
FIGURE 25

Learning and Innovation

Level of Learning	Level of Innovation	Key Questions	Domain Focus & Scope			
			Owner	Dev.	User	Oper.
CREATIVITY	CREATIVE PERSON	Mission, Vision				
MEANING	GATEKEEPER	Needs				
CONCEPT	EXECUTIVE CHAMPION	Structure				
WILL	PRODUCT CHAMPION	Goal, Influence				
KNOWLEDGE	PROJECT CONTROLLER	Progress, Monitoring				
SKILL	PROJECT MANAGER	Participation, Communication				
ACTION	PRODUCER	Requirements, Production				

FIGURE 26

A Technology Assimilation Framework



Adapted from McKenney & McFarlan [1982(1): 115]

FIGURE 27

Implementing the Framework in Practice

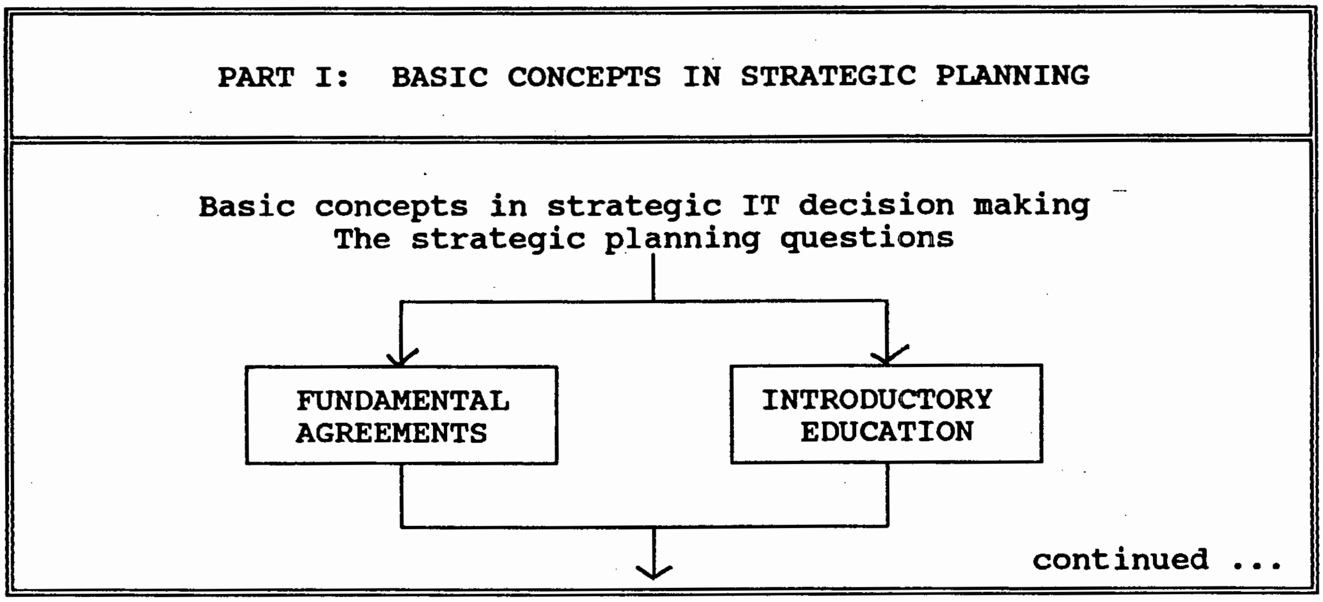


FIGURE 27 - Continued

Implementing the Framework in Practice

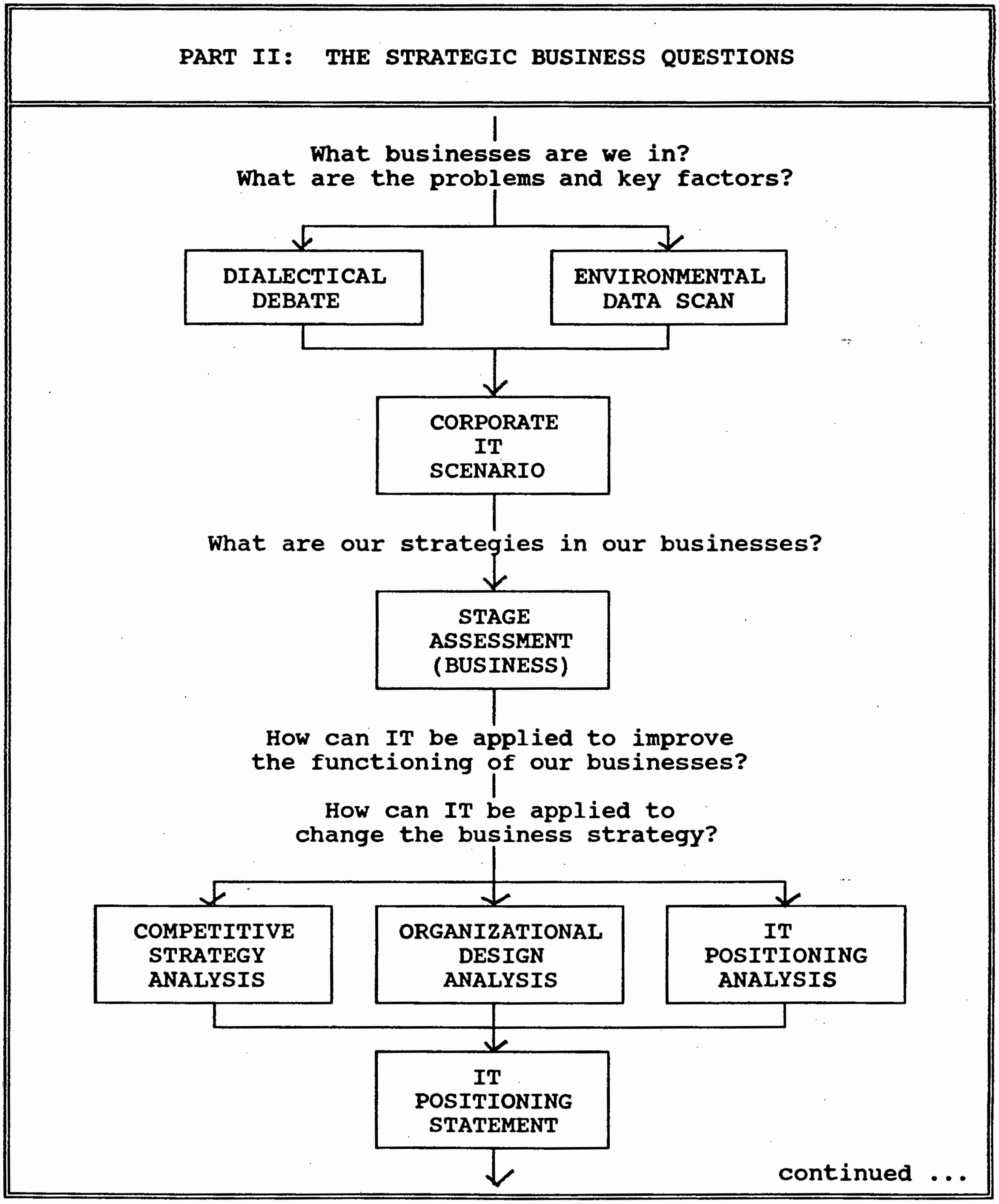


FIGURE 27 - Continued

Implementing the Framework in Practice

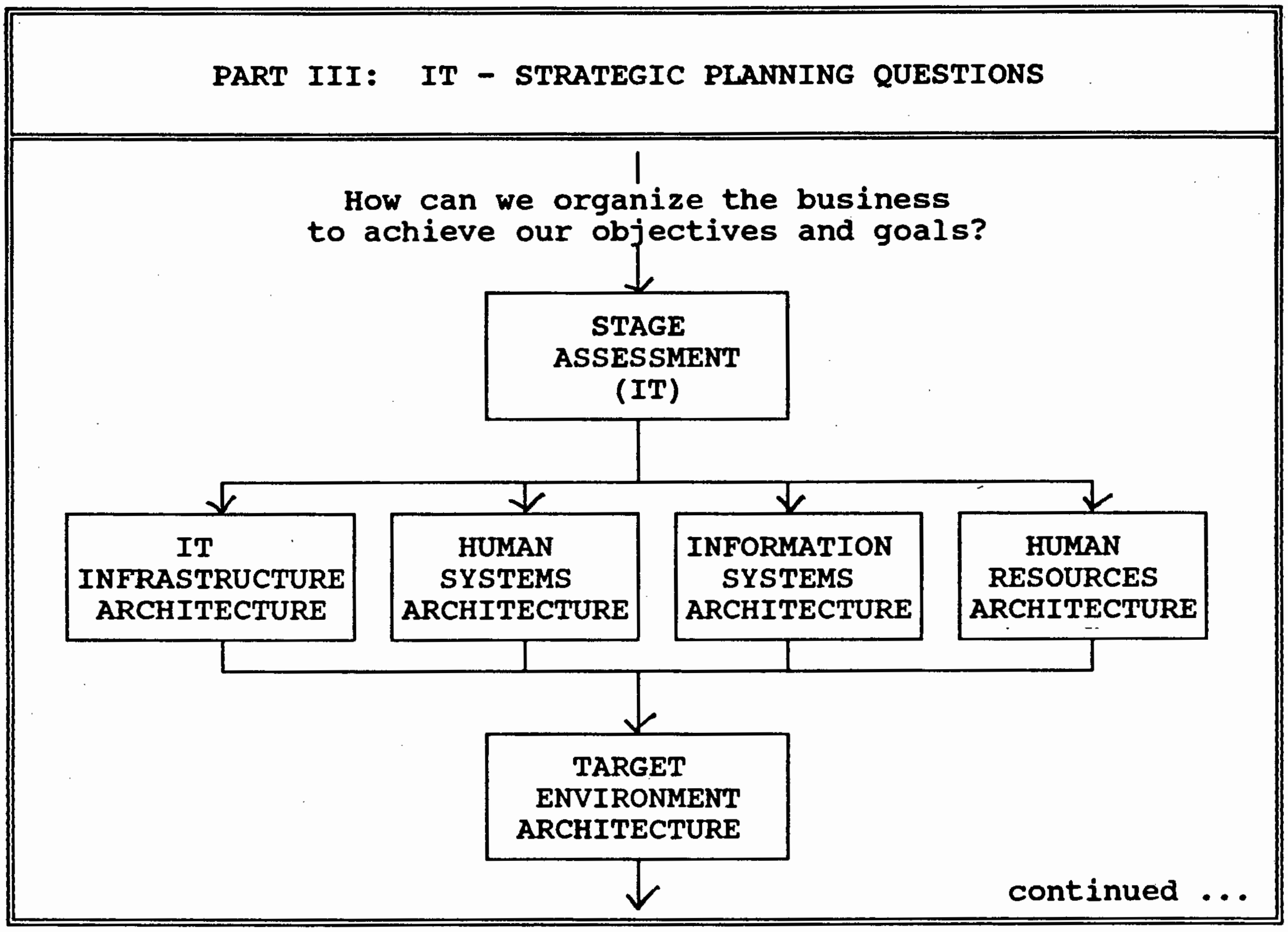


FIGURE 27 - Continued

Implementing the Framework in Practice

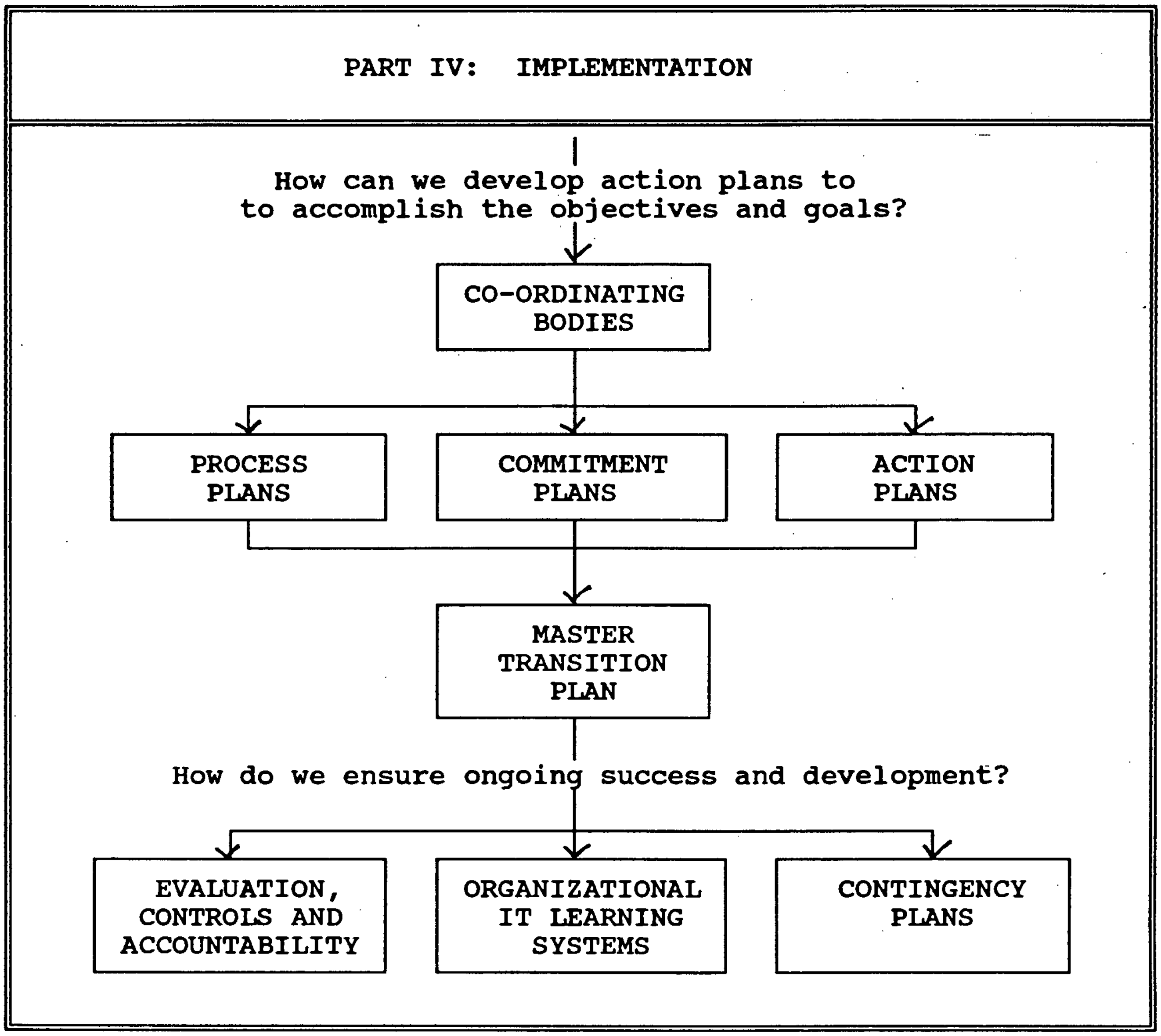
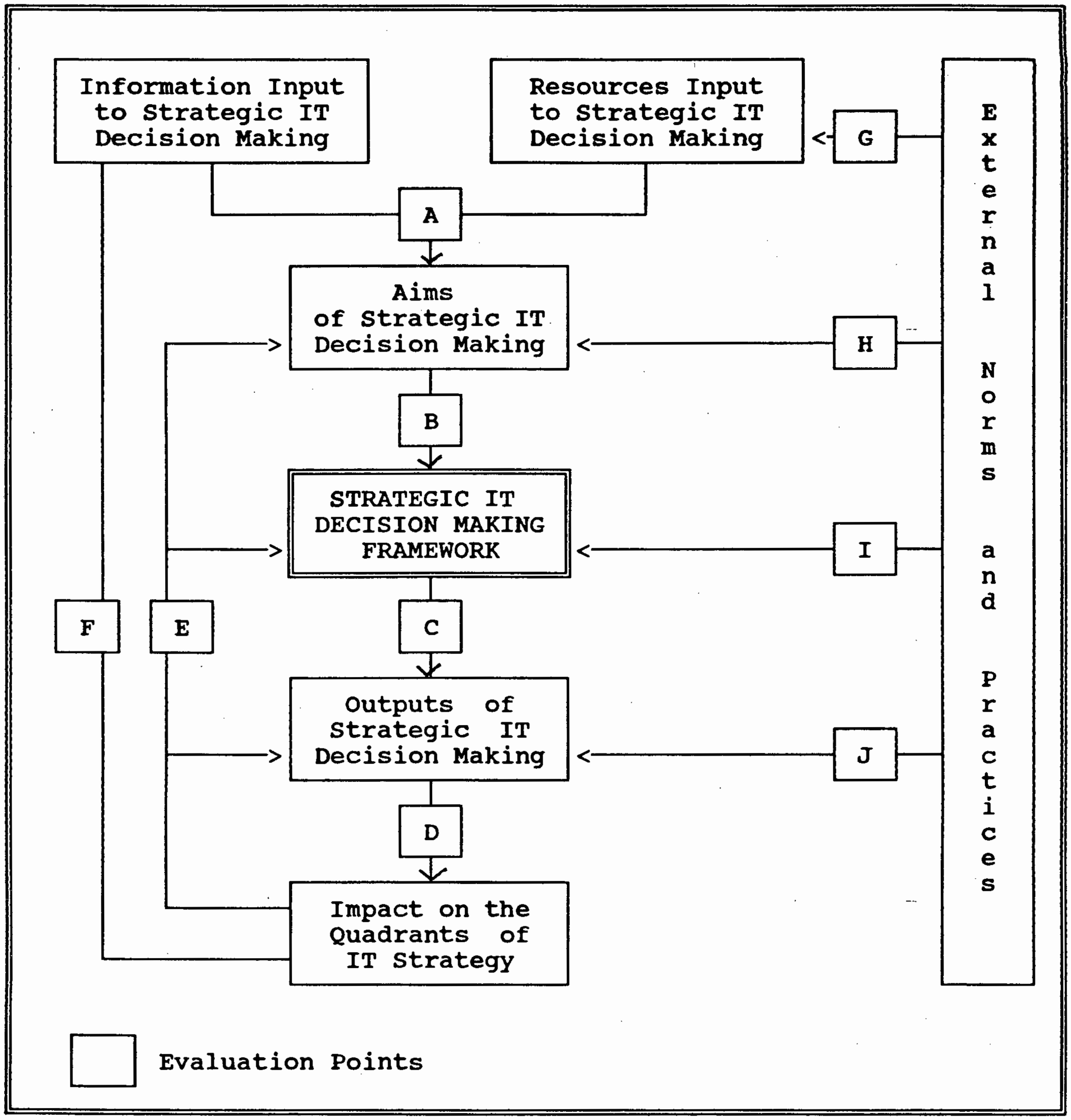


FIGURE 28

Evaluating the Framework for Acceptance



Adapted from King [1988: 105]

FIGURE 29

The Old and the New Perspectives

	TRADITIONAL PERSPECTIVE	THE NEW PERSPECTIVE
IT POSITIONING	Alignment strategy Competitive mode Reactive or preactive planning	Impact or alignment strategy Entrepreneurial or Competitive Mode Interactive planning
MASTER STRATEGY	Cost displacement Process efficiency	Many generic options
PURPOSES AND USES OF IT	Operations & control Management information Decision support	Competitive strategy Organizational design Strategic business systems
ORIENTATION OF APPLICATIONS	Internal Past & present needs	External Future potentials
ISSUES OF IT ORGANIZATION	Centralisation & decentralisation	Differentiation & integration
APPROACHES TO PROBLEM SOLVING	Flowcharts Hierarchies & segments Linear processes & phase theories	Dialectic Participation & domains Decision packets and transition stages
METHODOLOGIES	Closed-system Rational-comprehensive or incremental	Open-system Directed incremental
PARADIGM	User Requirements	Mutual Responsibility

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